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Rehabilitation*

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3rd International Congress of Physical Medicine  
IIIe Congres international de Medecine Physique  
3° Congreso internacional de Medicina Fisica  
3. internationaler Kongress für Physikalische Medizin

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OFFICIAL JOURNAL



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AMERICAN ACADEMY OF PHYSICAL MEDICINE AND REHABILITATION

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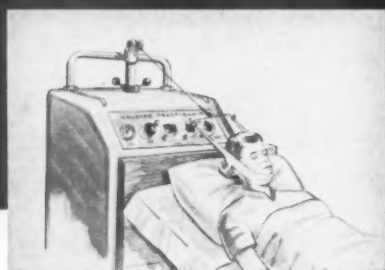
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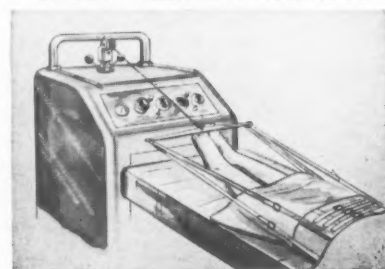
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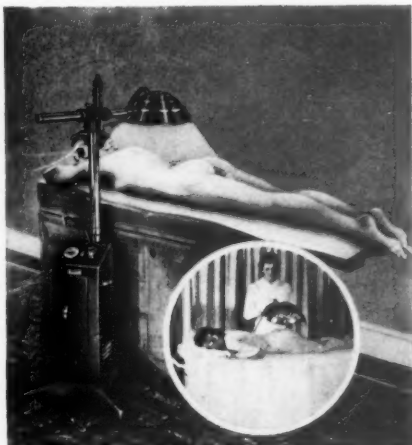
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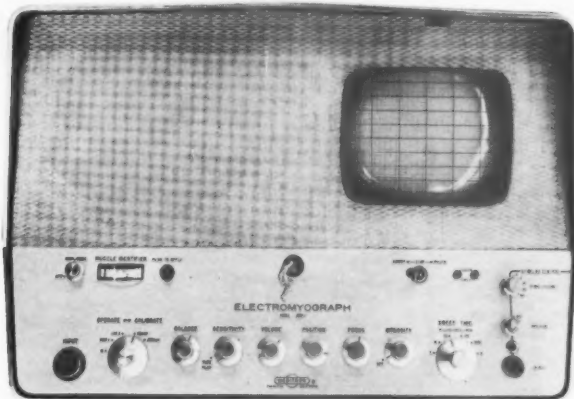
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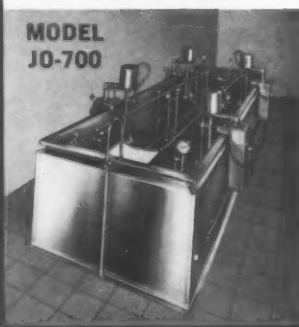
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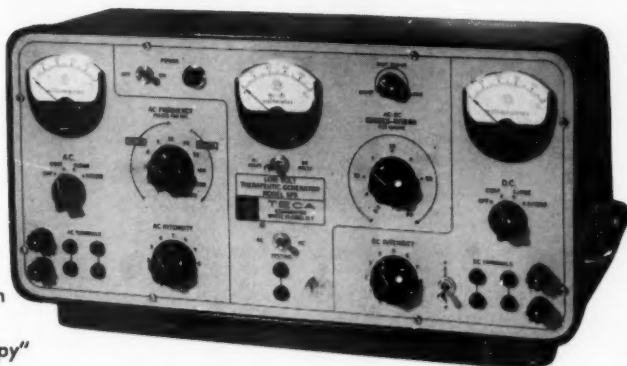
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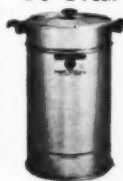
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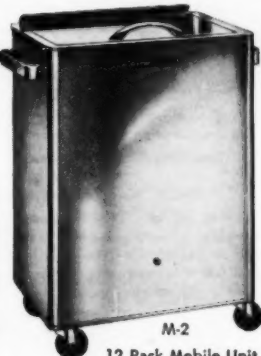
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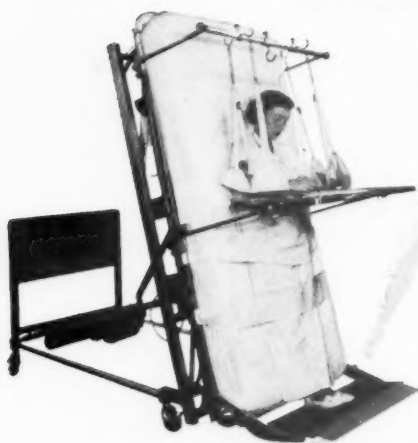
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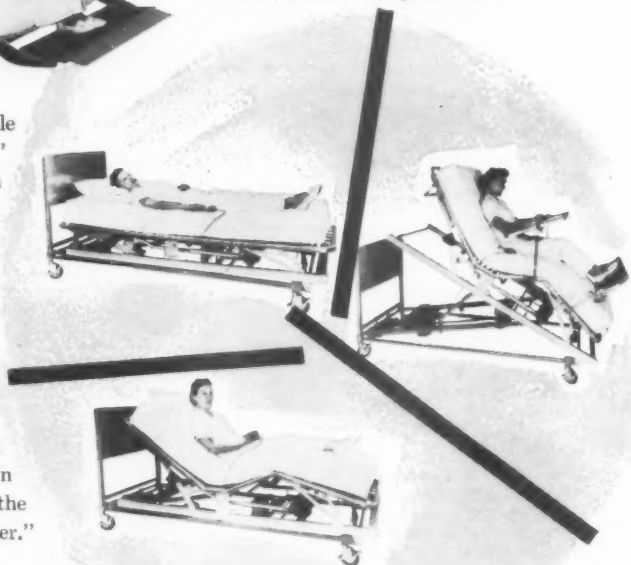
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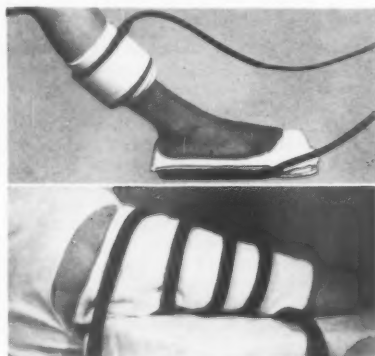
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# An Electromyographic Study of the Extrinsic-Intrinsic Kinesiology of the Hand: Preliminary Report

Charles Long, M.D.  
Mary Eleanor Brown, B.A., M.A.  
Gerald Weiss, B.S., M.A.  
Cleveland

● A combined electromyographic and cinematographic study of the intrinsic-extrinsic kinesiology of the hand has been undertaken at Highland View Hospital, Cleveland. Motion pictures of the hand were taken from the lateral view with the wrist unsupported in recurrent opening and closing motions. Simultaneous eight-channel electromyography was performed on the intrinsic and extrinsic musculature of the hand using skin electrodes and 37 micron copper or stainless steel wire electrodes. The recordings are synchronized and matched. Data is reduced to produce joint motion curves, to which the electromyographic output is correlated. Data is further reduced through the use of mathematical methods and an IBM 650 computer to give information concerning velocity and acceleration of the various segments of the hand during the test motion. The phasic relationships of intrinsic and extrinsic musculature are studied, with particular emphasis on the function of the intrinsic in opening and closing the hand. Qualitative findings are primary, and quantitative findings secondary only.

This is a preliminary report on an electromyographic and cinematographic method of study of extrinsic-intrinsic balance in the normal, moving hand.

The problem of extrinsic-intrinsic balance and coordination has fascinated students of the hand for many years. Several theories of cooperation between intrinsic and extrinsic musculature have appeared in the literature based upon detailed observations in the operating room and at the dissecting table. These theories have been further tested by watching abnormal movements or deformities in patients with peripheral nerve lesions involving the hands.

Existing theory represents some modification of the basic Bunnell principle,<sup>1</sup> that the load carried by the extrinsics or intrinsic is related primarily to the position of the metacarpophalangeal joints and the extensor hood. Since we have clinically observed exceptions or unexplainable phenomena when attempting to apply the Bunnell hypothesis, we felt it indicated to survey thoroughly the normal function of these muscles.

A survey of the literature shows that this job has been well started by certain careful observers. Lake<sup>2-4</sup> of St. Louis used oscilloscopic electromyography and still photographs which corroborated the

specialized functions of the palmar division of the interossei as predicted by Eyer and Markee<sup>5</sup> of Duke. Backhouse and Catton<sup>6</sup> used similar methods to cast much doubt on the general flexor activity of the lumbricals at the metacarpophalangeal joint.

## Method

For detailed further analysis of the moving hand, we felt that a combined motion picture and multichannel electromyographic method would be essential. A survey of the literature showed good basis for the use of such continuous electromyography. Inman has used it on normal gait<sup>7-8</sup> and the shoulder,<sup>9</sup> Basmajian<sup>10</sup> on the elbow, and Koepke and co-workers<sup>11</sup> on the intercostals.

In our study we take simultaneous motion pictures and multichannel electromyograms of the moving hand, recording key extrinsic and intrinsic muscles. In order to test the Bunnell hypothesis and allow room for growth of a new hypothesis if necessary, we subject the normal hand to a series of test motions including various positions of the metacarpophalangeal joints, but all motions having in common opening and closing the hand.

We are using an ink-writing Grass III-D electroencephalograph-electromyograph, with seven channels for recording

Read at the Thirty-Seventh Annual Session of the American Congress of Physical Medicine and Rehabilitation, Minneapolis, September 2, 1959.

This study was aided by a grant from The National Foundation to Western Reserve University and Highland View Hospital.

Principal Investigator, Western Reserve University-Highland View Hospital Hand Research Project; Associate Chief, Department of Physical Medicine and Rehabilitation, Highland View Hospital.

Chief Research Associate, Western Reserve University-Highland View Hospital Hand Research Project.

Research Associate, Western Reserve University-Highland View Hospital Hand Research Project.

and one for the marking and synchronizing device. It was a major decision at the onset of the project to use ink-writer instead of oscilloscopes as used by many previous observers. We decided on the ink-writer on the following grounds:

1. Ink-written records require no processing after they are traced, so can be examined while the subject is still in the electromyographic circuit.

2. Low expense of operation allows continuous tracings of all activities.

3. Initial expense of ink-writers is less than that of multichannel oscilloscopes.

4. The pre-amplifiers and amplifiers of the Grass III-D will handle easily all of the frequencies found in the electromyographic spectrum. The limitation occurs at the pens, which can write only below 100 cycles. However, the pens

serve as an averaging device in themselves and give an accurate picture of qualitative changes in potential, the factor in which we are interested.

Through the use of a second averaging device or integrator, the demand upon the pens can be reduced to well within their capacity, and the amplification process will still record all potential changes throughout the frequency spectrum.

The center line of figure 1 shows the unintegrated potential, and the line above it shows the simultaneous integrated tracing. Even without the integrator the changes are qualitatively accurate. The integrator simply allows easier reading of the final tracing. We continue to monitor our integrated traces on all muscles so that artefacts will not be absorbed by the integrator without our knowledge.

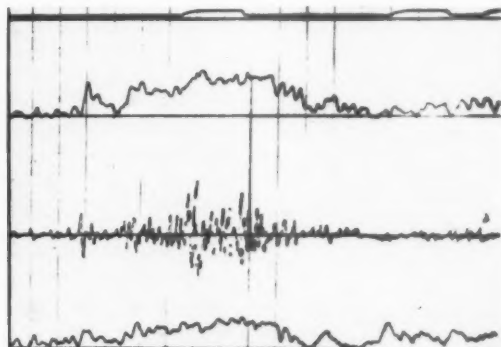


Fig. 1 — Ink-written electromyograms, showing nonintegrated tracing, center, and integrated tracings, above and below.

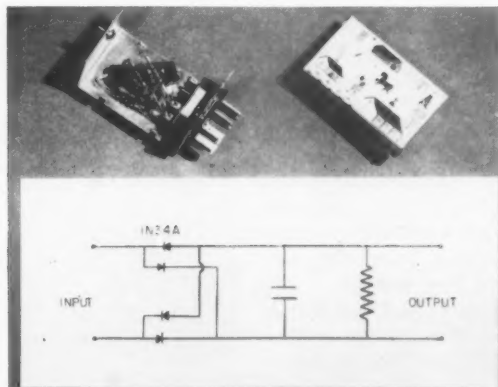


Fig. 2 — The Integrator and its circuit diagram: matchbox for comparison of size.

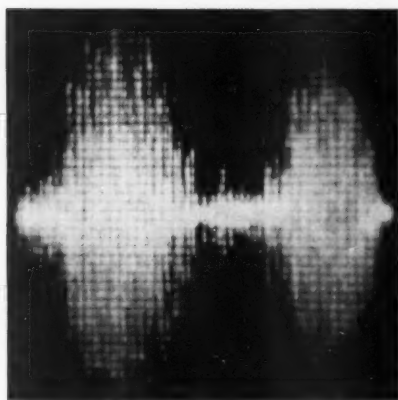


Fig. 3 — Oscilloscopic electromyogram of extensor digitorum showing extension, flexion, and again extension of the finger.

Figure 2 shows the integrator and integrator diagram, developed by transistorizing Inman's original averaging device. This device can be built for about \$40 and plugs into a standard socket in the Grass machine.

In spite of the continuous, ink-written monitoring system used to check the integrators, the possibility still existed that the Grass machine was not handling the input exactly as anticipated. We therefore began monitoring all electrodes oscilloscopically prior to their use on the ink-writer, and rechecking all electrodes after tracings are run. Typical results are shown in figure 3. This is a grasp-and-release contraction pattern for the extensor digitorum, with extension peaks at both ends, and flexion activity in the center. Figure 4 shows a segment of the ink-written recordings of the same motion, taken immediately after the oscilloscopic tracing of figure 3.

The ultimate advantages of the oscilloscope are many in single muscle analysis. With the help of the loudspeaker, aberrant potentials and poor electrode placement can be detected with great accuracy with the oscilloscope.

Figure 5 shows multichannel electromyograms of a sample motion. Integrated channels and their monitors are seen. The gross similarity of these separate muscle tracings made us suspect early that something was amiss. We had been using the skin over the olecranon as "neutral" territory against which to compare the pickup from skin, needle, and wire electrodes. This permitted the olecranon to record voltages from distant locations, making muscles with logically dissimilar functions appear to function similarly. The difficulty has been obviated by using only bipolar wire electrodes.

Motion picture frames are examined singly as in figure 6. Every other frame is measured, so that points of reference are located every  $\frac{1}{2}$  second with a camera speed of 24 frames per second. The position of each finger joint and the wrist joint are recorded.

Accumulated data are plotted as degrees of position against time in frames, as illustrated in figure 7 for the wrist, metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints. It was interesting to find that all joints start and stop at about the same time. This was also discouraging, for we had hoped that certain muscle actions and joint motions could be linked by their times of starting and stopping.

Joint displacement curves are matched with electromyographic tracings, as in

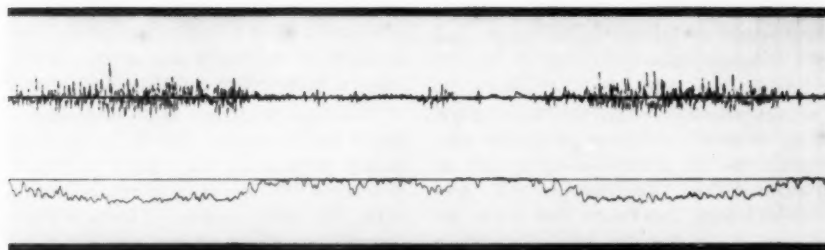


Fig. 4 — Ink-written electromyographic record of extension-flexion-extension motion; recording from extensor digitorum for comparison with oscilloscopic trace (fig. 3).



Fig. 5 — Integrated and unintegrated multichannel ink-written electromyograms of hand opening and closing.

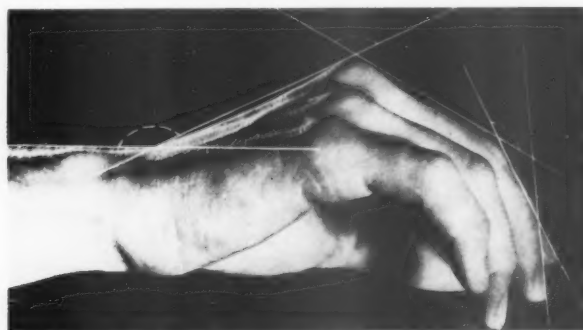


Fig. 6 — Single frame projection showing construction lines for measurement of finger and wrist joints.

figure 8. A flashing light in the camera field coincides with marker activation on the electromyographic tracing, allowing an error of less than one frame (0.04 seconds) in synchronizing the two records.

As a final step, some of our joint displacement data have been reduced to first and second mathematical derivatives, representing velocity and acceleration. Since muscles are responsible for acceleration, deceleration, and holding, these data will be essential to the final analyses. The data are processed through an IBM 650 computer and a Librascope plotter, resulting in a graph like figure 9. Data are plotted to the same scale as other displacements and electromyograms.

Previous investigators have used bipolar concentric needles for kinesiology work, with the exception of Inman who reports the use of bipolar wires such as illustrated here. The hand muscles present such long excursions that it was essential to develop an electrode which would follow the muscle, yet not impede its motion. We are presently using a

triple electrode of 37 micron enameled stainless steel, with two recording tips and one nonrecording wire which is barbed to hold it in the muscle. It is inserted in a hypodermic needle which is then withdrawn.

We found it necessary to use complete shielding against electromagnetic interference. Our shielded room has been made large enough to accommodate our photographic equipment and to allow later experiments in locomotion if desired. During the taking of kinesiology studies, an instructor for the subject remains in the room. The subject is asked not to watch the hand in motion for fear of prejudicing the motions. Continuous instruction may be necessary to prevent rotation of the hand out of the closely aligned field required by the experiment.

The synchronizer and electromyograph are located outside of the shielded room, preventing movement artefacts generated by operating personnel from affecting the tracings. Instructions through the screening are kept at a minimum, for the subject should be free to use his normal hand coordination.

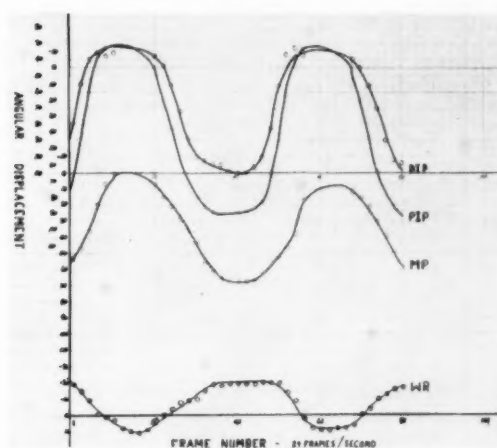


Fig. 7—Joint motion curves of wrist, metacarpophalangeal (MP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joints obtained from reduction of single frame data in opening and closing the hand.

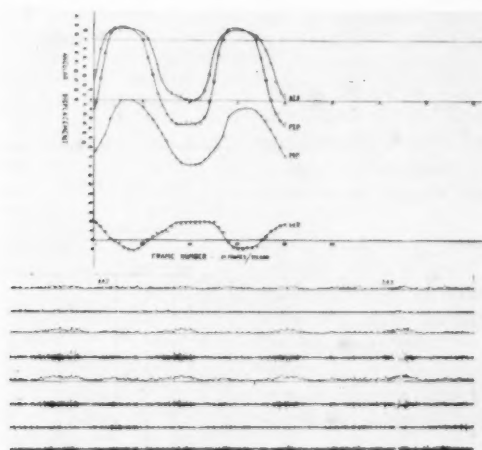


Fig. 8—Combined joint motion curves (top) and ink-written electromyograms in hand opening and closing.

In the first take, the subject performs free opening and closing of the hand, a test motion which includes the major components of many motions normally performed by the hand. Even three-jaw chuck motion is simply a limited expression of free opening and closing.

The second take requires that the metacarpophalangeal joints be held in flexion by the patient. This motion will test the concept that the extrinsics are primary interphalangeal extensors with metacarpophalangeals flexed.

The third take shows opening and closing with the metacarpophalangeals

extended, testing the hypothesis that interphalangeal extension becomes a prerogative of the intrinsics in this position.

In the fourth take the subject opens and closes the hand with the wrist supported. Supportive functions of the finger and wrist extrinsics are partially ruled out by this positioning.

A fifth take is recorded, with the subject opening and closing the hand freely to detect any possible changes from the first take due to fatigue, intramuscular pain, or training.

Amplification settings have been and will remain a problem for the scientific

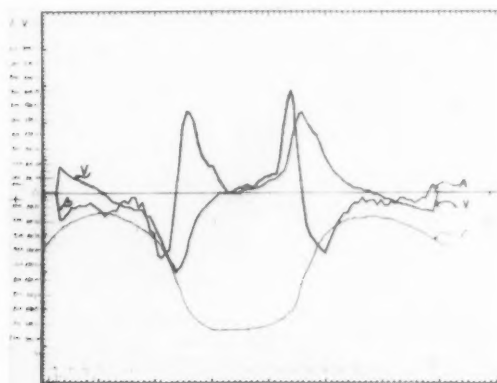


Fig. 9 — Final data reduction for distal interphalangeal joint in opening and closing. Acceleration (A), velocity (V), and joint displacement curves are shown.

conscience of our experiment. By increasing amplifications, increased activities may be apparently found, by the recording of a larger field of activity. Reducing amplifications in turn may cut out activities actually occurring within the electrode tip field. A just balance is established by careful observation of the tracing before each take, and amplification is rarely changed during the running of a take.

We have been able to eliminate most of the movement artefact often accompanying the excursion of electrodes within moving muscles. This has been done by the use of short leads on all electrodes, the firm gluing of electrode parts to each other, and individual care in the stabilizing of electrode leads on the arm.

#### Summary and Conclusions

A method has been presented for the simultaneous recording of hand motion and electromyograms to investigate the kinesiological balance between intrinsic and extrinsic muscles. Bipolar wire electrodes provide the pickups for multichannel, ink-written electromyography coupled with color motion pictures. Motion pictures are reduced to motion curves by single frame analysis and matched to the corresponding electromyograms. Further data reduction for velocity and acceleration of moving segments is carried out through electronic computers and plotters. It is hoped through this

method to investigate further the validity of the Bunnell hypothesis.

#### References

1. Bunnell, S.: *Surgery of Hand*, ed. 2, Philadelphia, J. B. Lippincott Company, 1948.
2. Lake, L. F.: *Electromyographic Study of Finger Movement*, abstracted, *Anat. Rec.* 127:322, 1957.
3. Lake, L. F.: *Electromyographic Study of Finger Movement: Dorsal Interossei, Extrinsic Flexor and Extensor Muscles*, thesis, Washington University, St. Louis, 1958.
4. Lake, L. F.: *Electromyographic Study of Selected Hand Muscles*, Washington University, St. Louis, 1954.
5. Eyler, D. L., and Markee, J. E.: *Anatomy and Function of Intrinsic Musculature of Fingers*. *J. Bone & Joint Surg.* 36-A:1, 18 (Jan.) 1954.
6. Backhouse, K. M., and Catton, W. T.: *Experimental Study of Functions of Lumbrical Muscles in Human Hand*. *J. Anat.* 88:133 (April) 1954.
7. Inman, V. T.: *Subcontractor's Report on Fundamental Studies of Human Locomotion and Other Information Relating to Design of Artificial Limbs*, National Research Council, Advisory Committee on Artificial Limbs, Final Report, September, 1945-June, 1947.
8. Inman, V. T.: *Pattern of Muscular Activity in Lower Extremity during Walking: Presentation of Summarized Data*, National Research Council, Advisory Committee on Artificial Limbs, Prosthetic Devices Research Project, Institute of Engineering Research, University of California, Berkeley, September, 1953.
9. Inman, V. T.; Saunders, J. B. deC. M., and Abbott, L. C.: *Observations on*



- Function of Shoulder Joint. J. Bone & Joint Surg. 26:1 (Jan.) 1944.
10. Basmajian, J. V., and Latif, A.: Integrated Actions and Functions of Chief Flexors of Elbow. J. Bone & Joint Surg. 39-A:1106 (Oct.) 1957.
  11. Koepke, G. H.; Murphy, A. J.; Rac, J. W., Jr., and Dickinson, D. G.: Electromyographic Study of Some of the Muscles Used in Respiration. Arch. Phys. Med. 36:217 (April) 1955.

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— from "Devil's Dictionary"  
 by AMBROSE BIERCE

# Muscle Relaxants in Cerebral Palsy; A Comparative Study. I: Meprobamate

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Brighton, Mass.

● A method of objective observation for the influence of drugs on the motor behavior of children with cerebral palsy is available in spite of the differences shown in maturity, skill, motor handicap and between successive periods of time for each child as well as the more obvious differences between children. Meprobamate showed no effect in specific doses for a prescribed period of time when compared with pre- and postmedication performance of children with spasticity due to brain damage. Side reactions were no more frequent during use of the drug than during use of the placebo.

A number of clinical studies have been performed to assess the effect of meprobamate on children with various types of cerebral palsy,<sup>1</sup> particularly with respect to behavior and changes in spasticity and involuntary movement.<sup>2,3</sup> The present study was undertaken to evaluate its influence on manual dexterity as shown by simple repetitive tasks which could be performed against time.<sup>4</sup> No subjective impressions have been included, since these are difficult to evaluate or quantify.<sup>5,6</sup>

## Material and Method

Five children in regular attendance at the Minneapolis Curative Workshop Cerebral Palsy Nursery School during the school year 1957-58 were chosen for an 8-month period of observation. There were four boys and one girl, ranging in age from two to four years. All showed some degree of spasticity in the upper extremities and two boys had athetosis in addition.

Since it would have been very difficult to have one activity which would be an adequate measure of manual skill for all five children, we decided to observe an activity which presented moderate difficulty for each so that improvement either from learning or from drug effect would be evident. The particular activity selected was then performed during the school year only during the short (2 to 3 minute) periods of observation twice weekly (table 1).

A long period (table 2, early control) ranging from 2 to 3 months was allowed for testing with no drug or placebo in

order to establish an accurate base line. Then the drug or placebo was administered. Following this, another month was allowed with no medication or placebo to re-establish a baseline (table 2, late control period) which would show the effect of learning or general improvement during the previous 6 months. Without this safeguard, at least one patient would have appeared to show a medication effect, where in reality it appears that "learning" was the factor responsible for improvement (table 3).

It was unavoidable that the therapist involved in testing should know that tablets were being used during part of the observation period since the medication or placebo was sent home from school with the child. However, it was not known to the staff or families whether a given child received the medication or the placebo during any given period. The medicine was supplied as red enteric coated tablets, 100 mg. of meprobamate each, with an identical size and shape red enteric coated tablet as placebo.\* During the first trial period the children started on one tablet three times daily following meals for 10 days, then two tablets three times daily following meals for 10 days.

One of the five children was observed during a "control" period of 3 months to establish the base line of performance. Three children who were observed for 2½ months participated in another study for 2 weeks during the month of January. The fifth child participated in the January study for only 1 week, so was observed for 2¾ months for control. Two children received the drug in

\* Meprobamate was supplied by Wyeth Laboratories.

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Table 1: Task Selected

Subject	Neuromuscular Symptoms	Task	Time Allowed, Minutes
B. B. ....	Spasticity	Remove small pegs from pegboard Transfer large balls to box	2
J. Z. ....	Spasticity	Drop marbles into marble chute	2
M. H. ....	Spasticity and athetosis	Transfer spools from box to box	2
D. S. ....	Spasticity and athetosis	Place spools on "tree"	3
P. M. ....	Spasticity	Place small pegs in pegboard	2

Table 2: Average Number of Successful Manipulations during Time Allowed

Subject	Early Control Period	Placebo	Meprobamate	Late Control Period
B. B. (balls) .....	5.5	4.80	4.00	2.0
(pegs) .....	2.66	2.10	5.60	4.4
J. Z. (marbles) .....	3.1	4.50	5.75	5.7
M. H. (spools) .....	0.45	0.14	3.75	0.14
D. S. (spools on tree) .....	6.55	8.60	8.50	8.8
P. M. (pegs) .....	6.75	11.25	9.40	11.5

Table 3: Average and Ranges of Performance under Varying Conditions\*

Subject	M. H.		D. S.		J. Z.		B. B. (Balls)		B. B. (Pegs)		P. M.	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Early control .....	0.45	0-2	6.55	4-15	3.1	1-5	5.5	3-7	2.66	2-4	6.75	5-8
Late control .....	0.14	0-1	8.8	5-12	5.7	5-8	2	1-4	4.4	0-6	11.5	10-13
Mepro- bamate .....	3.75	2-5	8.25	5-12	5.75	4-8	4	4-6	5.7	5-6	9.4	6-17
Placebo .....	0.14	0-1	8.6	2-13	6.0	4-7	4.8	3-6	2.1	1-4	11.25	9-16

\* Fractions represent arithmetical average of completed manipulations.

the first trial while three received placebo. A period of no medication or placebo intervened, following which the three previously on the placebo received meprobamate, while the other two who had previously taken meprobamate received the placebo. Following this was another short period of observation with no drug or placebo.

### Results

One child receiving meprobamate and one child receiving the placebo each had a transient period of drowsiness which the family attributed to the "drug." No other untoward reactions were noted, and whereas a previous study was abandoned because the uncoated meproba-

mate was so bitter the children refused to take it, in no instance was the present 100 mg. enteric coated tablet refused.

The averages of the number of successful performances of a given task per timed observation period are broken down into "early control period," "late control period," meprobamate, and placebo, as presented in table 2. Only one subject (M.H.) showed a significant increase in rate of manipulation during the use of the drug, but in a previous study showed no improvement. Statistical analysis fails to reveal significant differences in rate of performance which could be attributed to action of the drug in the other subjects or in the group as a whole when performances were averaged together.

### Summary

It is apparent from the results that a method of objective observation for the influence of drugs on the motor behavior of children with cerebral palsy is available in spite of the differences shown in maturity, skill, and motor handicap, and between successive periods of time for each child as well as the more obvious differences between children. In this way subjective error, effect of learning, and influence of other extraneous factors are minimized.

Meprobamate showed no effect in doses of 100 to 200 mg. three times daily for periods up to 1 month when compared with pre- and postmedication performance of four children with spasticity due to brain damage tested twice weekly for 8 months. One child, with mixed "tension athetosis" and spasticity performed better during this study when he received the drug, although during a previous study he showed no change. Side reactions were no more frequent during use of the drug than during use of the placebo.

**Acknowledgment:** The cooperation and interest of the staff of the Minneapolis Curative Workshop Nursery School made this study possible. Mrs. Marilyn Roegge, O.T.R., gave invaluable technical assistance during the planning and carrying out of the study.

### References

1. Berger, F. M.: Meprobamate: Its Pharmacologic Properties and Clinical Uses. *Internat. Rec. Med.* **169**:184 (April) 1956.
2. Gillette, H. E.: Relaxant Effects of Meprobamate in Disabilities Resulting from Musculoskeletal and Central Nervous System Disorders. *Internat. Rec. Med.* **169**:453 (July) 1956.
3. Perlstein, M. A.: Use of Meprobamate (Miltown) in Convulsive and Related Disorders. *J.A.M.A.* **161**:1040 (July 14) 1956.
4. Johnson, M. K.; Zuck, F. N., and Wingate, K.: Motor Age Test: Measurement of Motor Handicaps in Children with Neuromuscular Disorders Such as Cerebral Palsy. *J. Bone & Joint Surg.* **33-A**:698 (July) 1951.
5. Charash, L. I., and Cooper, W.: Experiences with Meprobamate in Cerebral Palsy. *Pediatrics* **21**:605 (April) 1958.
6. Lasagna, L.; Laties, V. J., and Dohan, J. L.: Further Studies on "Pharmacology" of Placebo Administration. *J. Clin. Invest.* **37**:533 (April) 1958.

Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.



He must be a poor creature who does not often repeat himself. Imagine the author of the excellent advice, "Know thyself," never alluding to that sentiment again during the course of a protracted existence! Why, the truths a man carries about with him are his tools; and do you think a carpenter is bound to use the same plane but once to smooth a knotty board with, or to hand up his hammer after it has driven its first nail?

—OLIVER WENDELL HOLMES

# Motor Nerve Conduction Velocity Studies in Poliomyelitis

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● During the late summer and fall of 1958, 100 patients were admitted to Children's Hospital (Columbus, Ohio) with the clinical diagnosis of acute paralytic poliomyelitis. At various stages in their illness, conduction velocity studies were performed on all the patients. The findings are presented and the diagnostic value of motor nerve conduction velocity determination in the differential diagnosis of polio-like diseases is discussed.

The determination of motor nerve conduction velocity is gradually gaining acceptance as a clinically useful examination. This procedure has been shown to be an objective method of further differentiating diseases of the motor unit.<sup>1</sup> In conditions affecting the axon, the conduction velocity is reduced; while the velocity is normal in diseases affecting the anterior horn cell body primarily.

This latter generalization is frequently questioned since Hodes,<sup>2</sup> in 1948, reported conduction velocities reduced in poliomyelitis. He postulated selective destruction of the large anterior horn cells and, therefore, the fastest conducting fibers.

This study was undertaken to verify the premise that the motor nerve conduction velocity is normal in poliomyelitis, and to demonstrate its value in the differential diagnosis of polio-like diseases.

## Background

Hodes'<sup>2,3</sup> work with conduction velocity in chronic poliomyelitis has received wide attention. He found 17 of 70 determinations on 26 patients (1.7 months to 13.5 years postpoliomyelitis) to be below 75 per cent of normal. The two lowest values were on single axons with muscle action potential picked up with intramuscular electrodes. He also felt that there was a direct relationship between reduced amplitude of muscle action potentials when nerve was stimulated and the reduced conduction velocities. He interpreted these data to show that the poliomyelitis virus selectively at-

tacks the large motor neurons and, therefore, the fastest conducting. The remaining smaller diameter fibers accounted for the slow conduction velocity.

Hendricksen<sup>4</sup> performed motor nerve conduction velocities on 27 poliomyelitis patients 2 months to 51 years after the acute onset. He found no case where the lowest value was below 72 per cent of the average normals. He could find no significant correlation between reduced amplitude and reduced conduction velocities. In one patient, whose intramuscular temperature in the vicinity of the tibial nerve was 27 C., the conduction velocity was 37 m./sec. (meters per second). When the limb was warmed to 35 C., the conduction velocity increased to 52 m./sec. well within the normal range.

Tasaka<sup>5</sup> reported a conduction velocity of 38 m./sec. in the ulnar nerve of a poliomyelitis patient and generalized that the values were low in this disease.

However, Herring and Knowlton<sup>6</sup> measured the conduction velocity in the ulnar nerve in normal subjects and patients with poliomyelitis. They found an average value of 57.0 m./sec. in the control subjects and 57.7 m./sec. in the poliomyelitis patients. They also measured single axon conduction velocity with ranges of 41.1 to 72.9 m./sec. and a mean of 56.9 m./sec. They found no simple relationship between the ampli-

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tude of the motor unit action potential and the impulse velocity.

Possible explanations for Hodes' reduced values include a reduced temperature in the paretic extremity, technical difficulty, or perhaps diagnostic error, since acute infectious polyneuritis may simulate poliomyelitis. The conduction velocity is uniformly reduced in acute polyneuritis (Guillain-Barré Syndrome).<sup>1</sup> The most reasonable possibility for his findings seems to be in the temperature of the extremity as was pointed out by Hendricksen. Hodes did not report the temperatures of the extremities in his study. Trott and co-workers<sup>7</sup> have shown that chronologic temperature changes occur in poliomyelitis with the cooling of a paretic extremity beginning around 5 or 6 months after onset of paralysis and reaching a maximum at about 18 months. They recorded differences of temperatures in paretic and nonparetic extremities of the same patients as high as 5 degrees C.

Hendricksen<sup>4</sup> reported a conduction velocity reduction of 2.4 m./sec. per degree Centigrade. One of us (Olsen) has data to support 5 per cent reduction in conduction velocity per degree C. Tasaki<sup>8</sup> reported 1.8 m./sec. reduction in velocity per degree C. in frog nerves.

To help clarify this controversy, it seemed logical to study the motor nerve conduction velocity, including temperature measurements, in a large group of poliomyelitis patients at various stages in their illness. Such an opportunity was provided by an unexpectedly high incidence of poliomyelitis in central Ohio in 1958.

#### Procedure

In the late summer, fall, and early winter of 1958, 100 patients were admitted to Children's Hospital (Columbus, Ohio) with the clinical diagnosis of acute poliomyelitis. On 99 patients, electromyographic examinations were performed 3 weeks or more after the onset of symptoms. Before electrodiagnostic tests could be performed, one patient died; however, post mortem examination confirmed the diagnosis of poliomyelitis.

A total of 162 motor nerve conduction velocity determinations were performed on 98 patients. Of these, one was so severely involved it was technically impossible to obtain a velocity determination. Generally, the initial motor nerve conduction velocity was done within the first 4 weeks of the illness. Subsequent examinations were 6 to 8 weeks later. All of the examinations were performed within 11 months of acute onset. There were 52 patients with laboratory evidence of poliomyelitis, either virus isolation from the stool or increase in antibody titer against poliomyelitis in the convalescent phase, 35 patients with Type I, 1 with Type II, and 16 with Type III.

A history of 3 Salk vaccine immunizations in proper sequence was given by 13 patients. Of these, 10 were subsequently shown to have poliomyelitis with the virus identified on 7 (4 Type III and 3 Type I). The remaining 3 patients had reduced velocities and were diagnosed as acute infectious polyneuritis.

The ages of the patients ranged from 4 months to 42 years. A majority of the patients were under 16 years of age, with 26 between 1 and 2 years of age. The hospital houses the National Foundation Regional Respirator Center where patients of all ages are admitted, so that older patients were available for study. The electromyographic and motor nerve conduction velocity examinations were performed with assembled components which have been described in detail elsewhere.<sup>1-9</sup> The apparatus (fig. 1) comprised a preamplifier, audio amplifier and loudspeaker, an oscilloscope with Polaroid camera attachment, a laboratory stimulator, a timing device, and stimulating and pickup electrodes. Both coaxial and monopolar needle electrodes were used in the electromyographic examinations.

The median and ulnar nerve in the forearm and the deep peroneal and posterior tibial nerves in the leg were stimulated at the elbow and wrist and knee and ankle respectively. Whenever technically possible, the nerves in the most involved extremity were examined. The ulnar nerve is the most superficial and, therefore, the easiest to examine. On in-



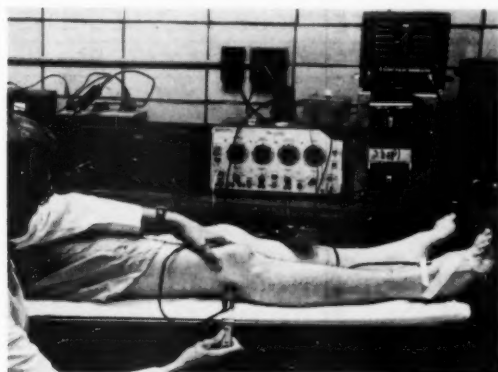


Fig. 1 — Photograph of the conduction velocity apparatus with the stimulating electrodes over the peroneal nerve. Note the active electrode over the extensor digitorum brevis.

fants, we have found the posterior tibial nerve the most accessible. Since patients are usually in the supine position and the lower extremities are more commonly involved, the deep peroneal is the nerve most frequently tested.

The stimulus was a square wave with an average duration of .2 to .4 milliseconds and an intensity of 60 to 90 volts. The intensity was increased until the muscle action potential no longer increased, then to insure supramaximal stimuli the intensity was further increased 30 per cent or the duration was doubled.

Temperatures were taken with a needle thermistor with the tip at the junction of the subcutaneous tissue and the muscle in the vicinity of the nerve at the approximate middle of its course in the forearm and leg. Temperatures were

obtained in a majority of the patients and in all patients who had reduced velocities.

#### Results

Of the total number, 92 patients (52 with laboratory evidence of poliomyelitis) had conduction velocities ranging from 40 to 69 m./sec., generally, within the normal range. The mean values in these patients for the peroneal, ulnar, median, and posterior tibial nerves were 50.0, 54.4, 53.2, and 49.0 m./sec. respectively (fig. 2).

There were 6 patients with conduction velocities reduced by at least 40 per cent of normal (fig. 3). The values ranged from 1.5 to 32 m./sec. None of these had laboratory evidence of poliomyelitis

### MOTOR NERVE CONDUCTION VELOCITY IN POLIO (AGE > 18 MO.)

NERVE	NUMBER	METERS / SECOND	
		RANGE	MEAN
PERONEAL	68	40-69	50.0 ± 7.2
ULNAR	19	44-64	54.4 ± 6.4
MEDIAN	13	44-66	53.2 ± 8.2
POST. TIBIAL	7	40-51	49 ± 3.6

Fig. 2 — Summary of the ranges, means, and standard deviations of 107 determinations of motor nerve conduction velocities performed on 87 patients with acute paralytic poliomyelitis.

## ACUTE INFECTIOUS POLYNEURITIS

	PERONEAL	ULNAR	MEDIAN
	M/S	M/S	M/S
J.B. 1/2 YR ♂	1.5		4.0
K.L. 2 1/2 YR ♀	16.5		14.1
M.W. 8 YR ♂	23.1	27.2	
J.M. 8 YR ♂	30.0	21.6	20.2
N.W. 11 YR ♀		24.8	22.1
S.F. 19 YR ♂		8.9	

Fig. 3 — Summary of the conduction velocities of 6 patients with acute infectious polyneuritis (Guillain-Barré syndrome) taken within a week of hospital admission.

and their subsequent clinical course verified the diagnosis of acute infectious polyneuritis.

In only those patients with laboratory evidence of poliomyelitis (virus isolation or antibody rise) the mean value for the conduction velocity in the peroneal nerve was 49 m./sec., not significantly different from the mean of the total sample, 50 m./sec.

A 22-year-old pregnant woman had consistently reduced velocities (28 to 32 m./sec.) with what initially appeared to be clinical poliomyelitis. However, on careful followup, she has shown clinical improvement which is highly suggestive of a polyneuritis. She now has discarded bilateral long leg braces and walks only with forearm crutches. Conduction velocities performed 11 months after her onset of symptoms still are reduced greater than 40 per cent.

On 99 patients, electromyographic examination revealed evidence of lower motor neuron disease.

In 39 determinations in the arm, the mean temperature was 35.04 C. In 67 determinations in the leg, the mean temperature was 34.16 C.

On 5 patients below the age of 18 months, the velocity ranged from 31.9 to 40 m./sec.

#### Discussion

The data presented support the premise that the conduction velocity in motor

nerve fibers in patients with poliomyelitis is within the normal range. Normals for unselected patients referred to an electrodiagnostic laboratory have been reported by Hendricksen<sup>1</sup> at the Mayo Clinic and by us.<sup>1</sup> Hendricksen's mean values for normals were 59.1 m./sec. for the ulnar nerve, 58.5 m./sec. in the median nerve, and 51.2 m./sec. in the peroneal nerve. The values for patients with an anterior horn cell disease did not differ substantially from his normals. None was below 40 m./sec. Our normals, ulnar nerve 55 m./sec., median 54 m./sec., peroneal 50 m./sec., posterior tibial 48 m./sec. are slightly lower than Hendricksen's.

The several factors known to affect the conduction velocity in motor nerves, particularly diameter, temperature, and age, must be considered in each determination.

The temperature of a paretic extremity in "chronic" poliomyelitis has been shown to be significantly lower than an uninvolved limb and, apparently, this can result in reduced conduction velocities.

This aspect has interested us considerably and we have searched for individuals with postpoliomyelitis paralysis of one extremity only so we could check the temperatures and conduction velocities in both paretic and sound extremities. A 6-year-old boy in this group, 4 years postpoliomyelitis, had a temperature of 30 C. and a conduction velocity

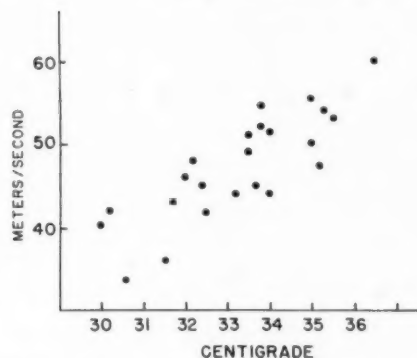
INTRAMUSCULAR TEMPERATURE & CONDUCTION  
VELOCITY IN PERONEAL NERVE

Fig. 4 — Graph showing the relationship of conduction velocity and intramuscular temperatures in "chronic" poliomyelitis patients.

of 40 m./sec. in the paretic extremity. On the sound side the temperature was 33.5 C. and a conduction velocity of 54 m./sec.

Figure 4 shows the relationship of temperature and conduction velocity in a group of patients with "chronic" poliomyelitis. These patients were not included in the study since their acute onset was not during 1958.

Since the conduction velocity is roughly proportional to the diameter of the axon<sup>10</sup> the infant would have reduced velocities corresponding to his small-diameter motor axons. Newborns average 27 m./sec.<sup>11</sup> We have found low-adult values reached usually by 18 months, thus included all above 1½ years in our normals.

It is probable that our average values, which are slightly lower than Lambert's and Hendricksen's can be explained on this basis.

The 6 patients with marked reduction in their conduction velocities all presented diagnostic difficulties on admission. A majority of the staff initially diagnosed acute paralytic poliomyelitis. Frequently these patients are not admitted for several days or a week after onset of symptoms. Since the spinal fluid findings after 5 or 6 days in poliomyelitis are quite similar to acute infectious polyneuritis (Guillain-Barré syndrome) and

the clinical findings are similar, this confusion is understandable. Here is where the motor nerve conduction velocity is most helpful since, as early as 2 weeks and usually by 3 weeks, there is a significant reduction. Generally, later in the course of the disease the values drop even lower. The conduction velocity may be reduced before the fibrillation potentials appear.

Since the conduction velocity is normal in poliomyelitis and reduced in polyneuritis, this examination provides objective evidence for the differential diagnosis. All 6 patients have had complete clinical recovery from their weakness, and now their conduction velocities are approaching normal (fig. 5).

The only puzzling patient was a 22-year-old pregnant woman whose clinical and electromyographic diagnosis was poliomyelitis, but whose conduction velocities on repeated examinations have been reduced greater than 40 per cent with normal temperatures in the extremities. An unusual finding in the upper extremity was the ulnar nerve innervating the thenar muscles. Fortunately, we have had the opportunity for 11 months' followup and it is the majority staff opinion that her rather dramatic and continued improvement places her in the category of polyneuritis. She still has symmetrical weakness of a moderate degree.

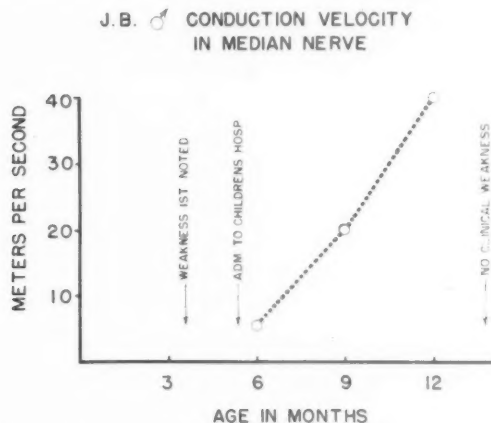


Fig. 5 — Repeated determinations of the conduction velocity of the median nerve in a patient with acute infectious polyneuritis demonstrating the return to normal after 7 months.

### Summary and Conclusions

Motor nerve conduction velocity studies were performed on 98 patients admitted with acute paralytic poliomyelitis to Children's Hospital, Columbus, Ohio, in the latter half of 1958. The results are reported and the value of this determination in the differential diagnosis of poliomyelitis discussed.

The motor nerve conduction velocity in patients with paralytic poliomyelitis is within the normal range if the temperature in the extremity is normal.

Determination of the motor nerve conduction velocity is an objective aid in differentiating acute infectious polyneuritis (Guillain-Barré syndrome) from acute anterior poliomyelitis.

Reduced temperatures of paretic extremities can result in significant reduction of the conduction velocity.

### References

- Johnson, E., and Olsen, K.: Clinical Value of Motor Nerve Conduction Velocity Determination. *J.A.M.A.*, to be published.
- Hodes, R.: Selective Destruction of Large Moto-neurons by Poliomyelitis Virus: I. Conduction Velocity of Motor Nerve Fibers of Chronic Poliomyelitis. *J. Neurophysiol.* 12:257 (July) 1949.
- Hodes, R.: Electrical Activity of Single Motor Units in Human Poliomyelitis. *Fed. Proc.* 6:130 (May) 1947.
- Hendricksen, J.: Conduction Velocity of Motor Nerves in Normal Subjects and Patients with Neuromuscular Disorders. Thesis, University of Minnesota, June, 1956.
- Tasaka, S., and others: Clinical and Experimental Studies of Conduction Velocity in Peripheral Nerves: On Maximum Conduction Velocities of Motor Fibers of Human Ulnar Nerves, read before the American Association of Electromyography and Electrodiagnosis, Philadelphia, Aug. 24, 1958.
- Herring, J., and Knowlton, G.: Impulse Propagation Velocity in Ulnar Nerve, read before the American Association of Electromyography and Electrodiagnosis, Philadelphia, Aug. 24, 1958.
- Trott, A. W.; Nesline, M. D., and Green, W. T.: Chronology of Circulatory Changes in Poliomyelitis. *J. Bone & Joint Surg.* 40-A:245 (April) 1958.
- Tasaki, I., and Fujita, M.: Action Currents of Single Nerve Fibers as Modified by Temperature Changes. *J. Neurophysiol.* 11:311 (July) 1948.
- Burk, R.: Development of Clinically Adaptable Method for Determination of Conduction Velocity in Intact Human Motor Nerve. Thesis, Ohio State University, 1955.
- Gasser, H. S., and Grundfest, H.: Axon Diameters in Relation to Spike Dimensions and Conduction Velocity in Mammalian Fibers. *Am. J. Physiol.* 127:393 (Sept.) 1939.
- Lambert, E., and Thomas, J.: Nerve Conduction Velocity and "H" Reflex in Infants and Children. *J. Appl. Physiol.*, to be published.

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# Kinesiology of the Temporomandibular Joint

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● A study of the kinesiology of the temporomandibular joint is discussed in relation to the functions of speech, respiration, mastication, deglutition, head posture and the special senses. It includes cineradiographic observations of the temporomandibular joint and the pharyngeal musculature; electromyographic records of the muscles associated with joint movement; three dimensional studies of the functional and extreme ranges of movement of the joint; the neurophysiologic mechanisms and the psychologic components of the joint function. The study discusses the therapeutic implications in the field of physical medicine and rehabilitation in relation to nutrition, speech re-training, body posture and the psychological well being of the patients. It also discusses the similarity between the common clinical problems of temporomandibular joint pain syndrome and low back pain syndrome.

The incidence of temporomandibular joint pain and disability has increased in recent years. The principal symptoms are pain in the region of the joint, limitation of mobility of the mandible, crepitus, clicking sounds in the joint, and, frequently, tinnitus. Since the joint is pertinent to the function of deglutition, mastication, respiration, speech, and head posture, its integrity is important in the nutritional and psychological status of the chronically sick and aged patient. The mobility of the joint permits the changes in contour of the maxillo-facial structures as required for the performance of the varied functions.

## Clinical Syndrome

The disability associated with the joint arises principally from its effect upon the mobility of the mandible and its associated musculoskeletal structure. The cause of the disability may be organic, functional, or both. The disability may result from degenerative changes in the joint mechanism, the musculoskeletal or nervous systems, hormonal dysfunction, surgical or traumatic impairment, dento-alveolar disease, agenesis, or disorganized dental occlusion.

The following clinical examples reveal the effects of temporomandibular joint dysfunction in the management of the chronically sick.

**Collagen Diseases.** In rheumatoid arthritis the joint may be so involved by bone changes that the head of the mandibular condyle is fused to the articular fossa in the base of the cranium. Fusion prevents mastication of food and, as a

result, the nutritional status of the patient degenerates rapidly because he is forced to live on a liquid diet. Inanition is a frequent concomitant of such fusion. If the osteoid changes do not result in fusion but only seriously limit the mobility of the condyle, the patient frequently resorts to a soft, high carbohydrate, nondetergent diet and obesity often ensues.

**Hormonal Disturbances.** The acromegalic patient has a disproportionate growth of the mandible in relation to the maxilla and the cranium. The patient in the later stages of the disease is unable to close his mouth or to occlude his teeth because the enlarged coronoid process of the mandible cannot by-pass the zygomatic process. This limitation of movement, coupled with muscle weakness, seriously involves the nutritional status of the patient. It also affects his esthetic appearance, resulting in related emotional and psychological problems.

**Neuromuscular Disorders.** The spastic patient is unable to maintain appropriate patterns of mandibular closure consistent with good dental occlusion. The natural teeth degenerate rapidly and are frequently lost prematurely. When artificial dentures are substituted, they rapidly deteriorate the residual tissues. In addition to the chronic masticatory disability, the deglutitive mechanism functions poorly because of in-coordinated lip and tongue muscular action. Frequently food is projected out of the mouth and wasted rather than ingested. This reduced ingestion, coupled with higher energy and protein requirements of the neurologically involved patient, frequently creates a state of chronic malnutrition.

**Surgical and Traumatic Injuries.** The surgical removal of the joint due to

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trauma or malignancy is associated with speech and masticatory disability. It is interesting to note that the loss of one joint is frequently a greater disability than the loss of both joints because, in the latter case, the whole mechanism is rendered stable by creating a bilateral disability. Subluxation and dislocation of joints are common in senile patients with long-term weakness who are bedridden and lie prone for long periods. Artificial dentures frequently do not function well for these patients because the dentures were made for mastication when the joint was associated with erect head posture.

*Neurotic Patient.* The neurotic patient with natural teeth frequently associates severe temporomandibular joint or facial pain with arthritis or some other chronic disease with which he suffers. This pain may be due to faulty dental occlusion, but because the patient has multiple disease problems, it is not uncommon for him to exhaust the services and skills of several physicians and dentists before it is determined that the facial pain is due to faulty dental occlusion.

### Kinesiology

The diagnosis and treatment of the temporomandibular joint depends upon the examination of the mobility of the joint. Traditionally, the mobility of the joint has been examined by clinical observation of the range of motion of the mandible, graphically by tracing devices, by radiographic studies, and by dissection on the cadaver and the live specimen. More recently, the joint motion has been studied by cineradiographic and electromyographic methods. It is interesting to note that these latter methods have substantially supported the many theoretic concepts and clinical procedures currently practiced.

*Functional Anatomy.* The temporomandibular joint is unique among all joints of the body. It is a diarthroidal ginglymous joint (a sliding hinge joint). It is paired, and the joints act alternately as axes of rotation for each other. Each joint limits the range of motion of the other. The sliding or translatory action

of the joint, coupled with both horizontal and vertical rotation, permits the mandible and its associated structures to move them a considerable volume of space during function.

The joint has its own phylogenetic development. The reduction of the number of jaw bones to the single mandible and its joints in the vertebrates permitted the development of increased energy and power with greater efficiency in the masticatory function. The essence of the increased efficiency is the mobility of the joint. Generally the degree of masticatory function is directly proportional to the degree of mobility within functional ranges of motion. For example, the loss of joint mobility by immobilization or ankylosis of the joint structures by disease destroys the masticatory function and seriously impairs deglutition. Such patients may deteriorate rapidly due to malnutrition with resulting inanition. On the other hand, loss of the joint by surgery or by agenesis only limits the range of motion and thereby reduces the power which the masticatory muscles can generate, but it does not eliminate the masticatory function. Such patients, with judicious selection of food, carry on quite well.

The temporomandibular joint thus differs from other joints in that fusion of other joints can be an effective therapeutic procedure. It can never be for the temporomandibular joint. Further, an elbow or knee joint which is surgically removed renders the extremity useless unless it is braced or fused, whereas the surgical removal of the temporomandibular joint is not only very effective therapeutically, but it can be a dramatically life-saving procedure.

*Range of Motion.* The functional range of motion of the mandible traverses only a part of its potential range of motion. However, the efficient use of the narrower functional range depends upon having available the full potential range of mobility without pain and disability. Conversely, when the potential (extreme) range of function is impaired, the functional range of motion and the efficiency of the joint are considerably reduced.



The mandible has a great freedom of movement and is freely movable within the border surfaces of a three-dimensional body of space. This movement is a projection of the condyle movement which, while it is not in direct proportion to the direction of and magnitude of the latter movement, does describe an approximately similar volume of space.

It is possible to demonstrate the extent of mandibular movements by recording the movement of a graphic indicator fixed to the mandible a few centimeters ventral to the incisal edge of the lower anterior teeth. Models of a plastic material showing the reconstruction of the tracings of the movement of the incisal edge of the mandibular incisor demonstrate the extensive range of motion at the incisal edge. The tracings indicate that the condyle head of the joint has a considerable range of motion. This is borne out radiographically.

*Radiography and Cineradiography.* Radiographic study of the joint movement reveals the very surprising range of motion of the condyle. In two patients with normal condyles, radiographs were taken in series showing the mandible depressed successively  $\frac{1}{4}$  inch,  $\frac{1}{2}$  inch, 1 inch, and 2 inches. In the one case the condyle began to leave the fossa at the  $\frac{1}{4}$ -inch opening, in the other the condyle remained in the fossa until a 2-inch opening was effected. These demonstrate the wide variability of the joint movement. In these instances it is suggested that the movement pattern and the anatomy of the fossa were developed by the shape, contour, and position of the developing dental arch.

Cineradiographic studies were observed in two patients with occlusion disharmonies. One patient, a tense and anxious individual, had an acute joint pain syndrome. The other patient had a rather severe occlusion disharmony, but he was emotionally stable. He had some vague discomfort and complained of chewing difficulty, crepitus, and clicking, but he had no pain or prolonged muscle spasm. The films show slow and rapid opening and closing movement of the mandible and chewing motions with

barium-soaked crackers, on alternate sides of the mandible. A considerable mobility of the condyle head in spite of the painful symptoms was noted in both cases.

*Electromyography.* Electromyographic studies of the masticatory muscles by several investigators who used implanted needles and skin electrodes revealed the following.

1. The various movements of the temporomandibular articulation are effected by the regulated interaction of several muscles.
2. Depression of the mandible is achieved by early contraction of the external pterygoid process and by contraction of the digastric muscles at the end of the movement.
3. Elevation of the mandible is achieved by the coordinated contraction of the internal pterygoid process and masseter and temporal muscles.
4. Lateral movements of the mandible are achieved by the ipsilateral contraction of the temporal and contralateral contraction of the external and internal pterygoid processes.
5. Protraction of the mandible is achieved by simultaneous contraction of the external and internal pterygoid processes.
6. Retraction of the mandible is achieved by the contraction of the middle and posterior fibers of the temporal muscle.

When postural stability of the joint is not possible, continuous contraction appears and ranges from contraction of just a few fibers of individual muscles to the marked splinting reaction of all the muscles associated with joint movement. These studies reveal the differences between postural stability of the joint and postural instability of the joint due to occlusion imbalance and its effect on the temporal muscles. It has been demonstrated that muscles such as the temporalis can be placed in hyperactivity by postural imbalance or by occlusion contact on one side only while the other side is out of contact. This hyperactivity will persist and even involve the remaining muscles of the same side if the teeth do not contact again for some time, as

for example, during speech sequences. The hyperactivity will stop almost immediately if the occlusion or postural disharmony is removed and the teeth are permitted to make one stable simultaneous bilateral occlusion contact. This proprioceptive and touch stimulus is necessary to relieve the hyperactivity of the musculature. The release of pain is instantaneous and very dramatic.

**Neurophysiology.** The sensory input phenomena which cause and release spasms are under investigation currently; several significant factors may be noted at this time.

The motor control of swallowing, speech, and movements of the lips and tongue differs from the motor control of the somatic muscles of the legs and arms in that the nuclei in the medulla controlling these vital functions receive innervation from both cerebral hemispheres, whereas the nuclei controlling the muscles of the extremities receive their innervation chiefly from the contralateral hemisphere. This bilateral control of the muscles of the branchial derivatives calls for bilateral and simultaneous postural stability. When stimulation is repeatedly unilateral in character, the potential for hyperactivity in the muscles around a joint is established. Under a given set of anatomic factors coupled with a personality anxiety, the postural imbalance may give rise to an acutely painful situation similar in character to the professional cramp or low back pain. Psychological factors are nearly always associated with temporomandibular joint pain syndrome. These factors are similar to those appearing in patients with backache who exhibit such symptoms as anxiety, easy frustration, and pent-up emotions. The pain exaggerates the personality disorder, which in turn exacerbates the pain. It is in-

teresting to note that in nearly all instances of joint pain there are either some organic disturbances in the joint or some postural disorders associated with dental occlusion. Apparently the organic disorders require a particular personality syndrome to trigger off the acute stage. Relief is frequently very dramatic when bilateral postural stability is experienced by a proprioceptive and touch-or-contact experience of the teeth. This experience must be reinforced by assurance and firm but gentle psychological counseling. Treatment requires long-term care and counseling because the syndrome returns repeatedly, though less acutely, until the patient understands and controls the disability.

### Conclusion

The kinesiology of the temporomandibular joint has been presented in the following areas of study:

1. Anatomic considerations.
2. Graphic tracings of the range of motion of a point on the mandible.
3. Cineradiography.
4. Electromyography.
5. Neurophysiology.

There appears to be a high psychological component in all temporomandibular joint dysfunctions which is coupled with a basic organic dysfunction in either the joint, the teeth, or both. The spasms associated with joint pain may be similar in character to those in the muscles associated with low back pain. The sensory input associated with postural stability appears to be significant in causing and relieving the spasms. The loss of bilateral simultaneous stimulation associated with tooth occlusion can initiate a spasm and conversely the restoration of such simultaneous stimulation can relieve spasm.



## Development of the Prevocational Unit: Stanford Rehabilitation Service

Martin Acker  
and  
David A. Thompson  
Palo Alto

● The prevocational unit is visualized as one to be used for the evaluation of vocational potential of rehabilitation service patients, people who are presumably vocationally handicapped. This unit is also viewed as being an additional diagnostic tool, rather than as a replacement of other existing modalities. It should be used widely but not indiscriminately. The major medium of the prevocational unit will be work sample testing. The data derived from work sample testing will go beyond the identification or classification of factors pertinent to vocational capacity and will allow for the assessment of durability of these factors in time. It is also used in the teaching of rehabilitation concepts and work measurement technics to students in various specialties through observation and student participation in the testing procedures.

This report concerns an effort to develop tools which will enhance vocational prognosis. However, it is of equal importance as an illustration of values to be derived from broadening interdisciplinary cooperation in the field of rehabilitation. The prevocational evaluation operation of the Stanford Rehabilitation Service will represent from the outset of its planning the joint efforts of the Department of Engineering and the Rehabilitation Service. Consultations from the Department of Psychology and Special Education and from departments in the School of Business are also being sought, and there is the distinct possibility that participations of these disciplines will go beyond strictly consultative capacities. These relationships were sought out specifically by the Rehabilitation Service for reasons which are related to our view of a prevocational unit in particular and rehabilitation services in general.

Before becoming involved in outlining the details of development, we will present the thinking on which this development has been predicated. First, we see the prevocational unit as a laboratory to be used for the evaluation of vocational potential of rehabilitation service patients, people who are presumably vocationally handicapped. Secondly, we see this unit as being an additional diagnostic tool, rather than as a replacement of other existing modalities. Thus it will be used for patients in whom vocational

potentials cannot be adequately assessed from vocational counseling interviews or other standardized vocational aptitude and interest testing. While we anticipate that it will be used widely, we are determined that it will not be used indiscriminately. Thirdly, the major medium of the prevocational unit will be work sample testing. Fourthly, the data we derive from work sample testing will go beyond the identification or classification of factors pertinent to vocational capacity and will allow for the assessment of durability of these factors in time. Thus we see that work sampling is a method of testing in depth. Finally, it is also used in the teaching of rehabilitation concepts and work measurement technics to students in various specialties through observation and student participation in the testing procedures.

Like all testing, work sampling is a structured attempt to evoke behavior from which generalizations can be drawn. In work sampling, the stimuli consist of operations drawn from jobs actually performed in industry and business. The extent to which the responses are meaningful for diagnosis and prognosis of vocational capacity depends directly upon relationship between the testing and work activity which they purport to represent. Work samples, therefore, have to be constructed and standardized so that they call for the display of abilities and tolerances which bear a close resemblance to industrial requirements. It was on the basis of this understanding that the cooperation of industrial engineering was sought in the earliest developmental stages. It was particu-

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Department of Industrial Engineering, Stanford University.

This study was a joint project of Stanford University Rehabilitation Service and the Department of Industrial Engineering.

larly gratifying to the Rehabilitation Service to find that the Industrial Engineering Department desired to cooperate, not only for the assistance they could offer in the realistic development of work samples, but also for the opportunity to enhance their own teaching program.

### Planning

It was clearly understood from the outset that the materials, technics, processes, and much of the equipment and standards which would be used to construct work samples and make them meaningful would have to come from industry. It was our belief that the value of industry's cooperation would be enhanced by our being able to present to them a clear picture of our orientation and the objectives of our work. This necessitated an analysis of the components in jobs in industry which were amenable to testing and which would be applicable to the greatest number of patients of a rehabilitation service. This kind of analysis has provided us with the following structure. First, our primary concern would be with the kinds of jobs for which no specific prior technical training was necessary and which would not require unusual physical exertion. These would be jobs which are ordinarily taught new employees within relatively short periods of time and for which an employer would not require extensive previous experience. Secondly, we anticipated that the kind of data our work sample testing could provide would fall into four major areas.

The first area would be considered mechanical or manipulative, and would relate to the patient's ability to handle industrial equipment, tools, machinery, material, and processes. The second area is the physical and here the concern would be expanding the medical information regarding the patient's physical ability to tolerate various work positions, work routines, and work periods. The third area might be described as the intellectual or intelligence area pertaining to an evaluation of a patient's ability to understand operations and to absorb and remember sequences of processes, to

learn technics and to follow instructions similar to those which might be offered in usual job settings. It would also provide additional information regarding the patient's ability to handle abstract processes, such as calculations and spatial relations. The final area is the psychological, oriented to obtaining data from which could be made determinations regarding the patient's ability to persist in any given function, to understand the extent to which job situations produce stress or anxiety that would be detrimental to optimum job performance, to assess responses to various types of supervision, and if possible to assess capacities to handle varying social relationships engendered by particular kinds of work.

### Development of Work Samples

Within the frame of reference just outlined, guides were developed to give structure to the observations made in industrial visits. Specific items in the observation guides were drawn from the industrial engineering material, as well as from the wealth of material gathered in a tour of prevocational units. The observational visits to industry were planned by the industrial engineers on the basis of their knowledge of local firms. The objective of each visit was to view as wide a variety as possible of industrial assembly, machining, and clerical operations which demonstrated the characteristics incorporated in the observational guides. The visiting group included the vocational counselor of the Rehabilitation Service, faculty member of the Department of Industrial Engineering assigned to working in the development of the project, and two graduate engineering students who elected to do special projects in work sample construction.

Ten departments of three large firms were visited. These firms were in the electronics manufacturing, calculating machine manufacturing, and insurance industries. The purpose of the visits was not to find jobs that could be used as work samples, but to find in jobs manifestations of the characteristics our research indicated were components of a

large group of semiskilled jobs. The concentration of these visits then was on the manipulative, visual motor learning, and strength requirements of each of these jobs. Psychological and social requirements of each job were assessed, as was the extent to which the various important factors of any one job were also applicable to any of the others under observation. While there were differences in physical setting and in end products from one firm to another and often from one department to another, it became apparent that a core of what might be considered basic vocational skills was inherent in all of the jobs.

After analyzing the information obtained from the observational visits, it was apparent that a relatively small number of work samples can provide skill data pertinent to a rather broad area of semiskilled industrial and commercial occupations. We also determined that, except in very unusual circumstances, the test devised did not have to be specifically related to any individual jobs observed.

For example, we found that such apparently diverse jobs as four-tumbler lock assembly, some electronic component subassemblies, and subassembly of mechanical components in desk calculators all required, in very similar degree, the same job characteristics of work (such as finger dexterity, eye-hand coordination, visual acuity, and memory for sequence). Also, we found that many simple bench assembly operations required essentially the same job characteristics as those of a punch press operator. The important differences between these diverse jobs was knowledge of some basic, easily learned skills.

#### Current Stage of Development

The industrial engineers have now constructed several work sample tests. These tests are designed to obtain what we now consider to be basic job skill information in the area of manipulation, visual motor coordination, and ability to make varying kinds of discriminations. These tests will use materials, tools, and processes from the industries which we visited. The designs will be flexible

enough to allow for testing at the various levels of the basic characteristics described. They will also be designed to allow for continuous, productive operation beyond the initial diagnostic period. Thus, when necessary, patients can be observed in work testing situations up to several weeks at a time.

It is presently planned to vary the standard method for any given work sample to increase or decrease the complexity and difficulties of the test. This is accomplished by rearranging the workplace layout and by altering such equipment as jigs, fixtures, tools, or parts supply bins used in order to change the complexity of the various "grasps" and "positions" required by the work sample. Thus, one basic work sample may be made to vary over the range of complexities present in the job family it represents. In this manner, combinations of work samples, each of a given complexity, may be used to test for the work characteristics of a wide variety of industrial jobs.

Simultaneous to the physical construction of the work samples will be the work of standardizing time and quality for each of the operations. This will be done by means of standard time study procedures, using both stop watch technics and synthesized predetermined elemental standard times. The studies will be conducted by the faculty representative and students of the Industrial Engineering Department. In all cases, the standard time developed for a work sample of given complexity will represent the actual industrial standard time. That is, following an appropriate learning period, the patient's time to complete a task will be compared with the standard time it would require a typical industrial worker (with requisite skill, training, orientation, working under appropriate working conditions at a reasonable level of effort) to complete the same task.

Statistical correlation studies between the patient's required time and industrial standard times may then be made. Other guides for the administration, observation, scoring, and interpretation of the tests have yet to be developed, but they will lead to a recommended job

family or set of job families which the patient could perform satisfactorily under presently existing (as opposed to modified) industrial work conditions. Following a satisfactory analysis and industrial placement of a patient, statistical validation of the laboratory analysis by means of on-the-job observations are planned.

As indicated earlier, our concern is with learning ability and emotional tolerance as well as with skill potential. To serve these purposes, the administration of the tests and the supervision of the patients will vary on the basis of the problems presented. It will be in these

areas that the special skills and knowledge of the Departments of Psychology, Special Education, and Industrial Relations will be utilized. We are convinced that a considerable amount of flexibility in the use of work sample testing is necessary. We are further convinced, however, that our ultimate objective for each patient is the determination of his ability to develop and sustain levels of work behavior acceptable to industry. The balance between these two factors is necessary in order that the data derived from work sample testing have significant prognostic value.

Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.



It is good for one to tackle at least one hard job every day. Doing easy things offers no challenge, but if we do a hard job we find we have exercised our willpower, our mind and our body to a good purpose. One of the rewards of doing hard things is the capacity of doing still harder things. Then comes the greatest reward, the pride of accomplishment.

When we build, let us think that we build forever.

Let it not be for present delight, nor for present use alone

Let it be such work as our descendants will thank us for.

—RUSKIN



✱  
*editorial*  
✱

## *Postgraduate Education by Mail*

The February, 1960 issue of the *Archives* introduced a new section which is a systematic review of literature related to medical rehabilitation. This meets a long-standing need. The mass of scientific and medical journals published regularly is so vast that it is impossible today for any individual to read or review it all. In particular, clinicians who have a limited amount of free time find that they cannot keep abreast of the current literature in their own fields of interest. New information, both basic and applied, is appearing each month. Much of this information appears in specialty journals which have a restricted circulation.

As a service to its readers, the *Archives of Physical Medicine and Rehabilitation*, aided by a two-year grant from the American Rehabilitation Foundation, a subsidiary of the Sister Elizabeth Kenny Foundation, has begun to provide a systematic survey of journals closely related to the field of rehabilitation. Reviews from nine journals were published the first month. Shortly, abstracts from twenty-five journals will be appearing regularly. From each of the selected journals the most significant articles will be abstracted. The titles of other articles of interest for rehabilitation will be listed. This section, then, will provide the reader of the *Archives* with a comprehensive and systematic survey of twenty-five journals to help him to select his additional reading.

For the medical fellow in training in physical medicine and rehabilitation the new abstract section will provide a summary of the current literature with which he should be acquainted. As an examinee of the American Board of Physical Medicine and Rehabilitation, he will be expected to be familiar not only with the basic information in the field but also with recent literature. The survey of selected literature will provide a systematic guide for his necessary reading. Other reviews or abstracts of literature are available but none have been developed especially to meet the needs of the physiatrist. With this survey as a guide, the reader of the *Archives* can devote the time, which he would otherwise spend in searching the medical literature for articles with which he should be acquainted, in the more valuable reading of the most significant articles from a wide range of scientific journals.

— Frederic J. Kottke, M.D.

★  
*special article*  
★

## The President's Own

1 March 1960

Walter J. Zeiter, M.D.  
Secretary-General  
3rd International Congress of Physical Medicine  
30 North Michigan Avenue  
Chicago 2, Illinois

Dear Dr. Zeiter:

Reference is made to your request to the Department of Defense relative to the Marine Band.

A suitable section of the Marine Band has been assigned to provide music for the formal opening session of the 3rd International Congress of Physical Medicine on Monday morning, 22 August 1960 at the Departmental Auditorium here in Washington, D. C.

Sincerely yours,

W. L. Dick

Lieutenant Colonel, U. S. Marine Corps  
Aide-de-Camp

The music of the United States Marine Corps Band has grown with the development of the Corps' traditions—from the few men that marched the streets of Philadelphia on a cold morning late in November, 1775 to its present military and symphonic size. Drums and fifes were the only musical instruments used by our



United States Marine Band . . . "The President's Own"

military forces during the Revolutionary War. A group of ten or more, in those days, constituted a "band"; the Marines possessed as fine a "band" as any other military organization of the period. At the end of the Revolutionary War, when everything military was discontinued, the Marine Band was not heard of again until 1798, when President John Adams approved a bill which brought into existence the new Marine Corps and a new Marine Band.

Some of the "Musics," as they were then called, were sent out on recruiting duty and some served aboard the American men-of-war during the French Naval War from 1798 to 1801. Still others were retained in the national capital, which was then located at Philadelphia. The band's headquarters was moved to Washington in 1800, while that city was still mainly cow paths and wretched wooden buildings. Little is known of the early leaders of the group except that they were accomplished musicians and capable military men. The first and most famous of the band's modern leaders was John Philip Sousa, who added many spirit-stirring chapters to the pages of American military band music. Under Sousa, the band rose to glorious heights.



Lt. Col. Albert F. Schoepper, USMC  
Director, U.S. Marine Band

The Band's present Director is Lt. Col. Albert F. Schoepper. He has performed as a Marine Band conductor and soloist before kings, queens, and presidents for more than two decades. In 1934, Lt. Col. Schoepper joined the Marine Band. He served for many years as band member and was a frequent soloist on the Marine Band radio network programs. He also conducted at various White House engagements. In 1951, he was appointed Second Leader (Assistant Director), the position he held when he was designated Director of the Band in 1955.

Illustrious audiences are legendary with the band. They have played for notables and honored guests among whom were the Prince of Wales (Edward VII); the Prince of Wales, later King Edward the VIII (now the Duke of Windsor); King Albert of the Belgians; Queen Marie of Roumania; the Sultan of Muscat and Oman; the Crown Prince and Crown Princess of Sweden; President of Nicaragua; President of Chile; King George and Queen Elizabeth of England; President Auriol of France; Queen Juliana of the Netherlands; Queen Elizabeth II and Prince Philip of England; the Prime Minister of Ireland; the Chancellor of West Germany; the Prince of Belgium; and the President of Guatemala, to name but a few. Among those whose spirits were buoyed by the band's wartime renditions were the Prime Ministers of Poland, Canada, New Zealand, and Great Britain; the Presidents of Peru, Bolivia, Paraguay, Ecuador, Colombia, Haiti, the Philippines, and Czechoslovakia; Queen Wilhelmina of the Netherlands, and many others.

Since Jefferson's time, the Band has played at every inauguration held in Washington. Every President has called upon it to play for functions at the White House and all have praised its efforts. In a tradition handed down through the years, the Marine Band has come to be known officially as "The President's Own." This tradition stems from the close association the Band has always enjoyed with the White House.

At its first formal debut at the White House in 1801, the members of the Band wore brilliant uniforms of scarlet "coatees," trimmed with blue and gold; blue pantaloons, striped with scarlet, and brown hats with black leather cockades. Today, the uniforms usually prescribed for the Marine Band are special full dress, full dress, and undress blues. Special full dress and full dress are worn when the Band plays for state occasions. The coats are scarlet, continuing the traditions established as far back as 1798.

And so the Band stands today, a corps of the finest musicians in the land, to play at the international conference. The Marine Band has never toured abroad, but the world has come to America to hear it — as the world will come once again — to hear it play at the formal opening session of the 3rd International Congress of Physical Medicine on Monday, August 22, 1960 in the Departmental Auditorium in Washington, D. C.

—DOROTHEA C. AUGUSTIN



# ★ *survey of selected literature* ★

This systematic abstracting and indexing of selected journals is made possible by a grant from the American Rehabilitation Foundation, a subsidiary of the Sister Elizabeth Kenny Foundation.

## NEUROLOGY. Vol. 10, Feb. 1960.

◇ **Electroencephalographic Findings and Recovery from Aphasia.** R. S. Tikofsky; K. A. Kooi, and M. H. Thomas. pp. 154-156.

A sample of 33 adult aphasic patients, who received speech therapy for a period ranging from two months to two years, were divided into two groups, those who made no progress and those who made fair to good progress in speech therapy. The no progress group contained 16 patients of average age 56. The average age of the 17 patients in the fair to good progress group was 42 years. Electroencephalograms for each subject were made before or early in the course of speech therapy. The recordings were analyzed in terms of the background frequency for each hemisphere and the incidence and distribution of delta waves over the left and right hemispheres.

Thirteen of the patients in the no progress group exhibited frequencies below 8.5 cps. Sixteen patients in the fair to good progress group had basic frequencies greater than 8.5 cps. Prognosis was poor in those patients with abnormally slow patterns over the right hemisphere as well as the left. A left hemisphere delta focus was not inconsistent with a good prognosis. It is concluded that the electroencephalogram should constitute an integral part of the overall evaluation of the patient because of the strong evidence that slow background frequencies are associated with poor prognosis.

◇ **Dynamic Measurements of Rigidity, Strength, and Tremor in Parkinson Patients Before and After Destruction of the Mesial Globus Pallidus.** David D. Webster. pp. 157-163.

An apparatus has been constructed for quantizing rigidity, strength and tremor in Parkinsonian patients. The patient's forearm is coupled to a turntable by a split plaster cast. The force necessary to flex and extend passively the forearm through a range from 70 degrees to 170 degrees when exerted at a point 12 inches from the elbow is measured by the machine. The machine instantaneously records torque, arm displacement, and the work done by the machine. The work done during passive motion is a measure of rigidity. Gross tremor and cogwheeling is detected as a modulation of the torque plots. Records of active motion are obtained when the patient resists the turntable motion. Preliminary tests show that rigidity is a function of the state of consciousness and that simple procedures can be used to precipitate rigidity in Parkinsonian patients. The machine is able to quantize changes produced by medication and brain surgery as they affect the tremor and rigidity of the patient.

Some characteristic features of the pathogenesis of myotonia. *Grashchenkov, N. I.* p. 95.

Circulation of the spinal cord studied by autoradiography. *Otomo, E.; C. Van Buskirk, and J. B. Workman.* p. 112.

Cholesterol and fatty acids synthesis in diabetic nerve and spinal cord. *Eliasson, S. G., and A. H. Hughes.* p. 143.

Effects of radio frequency energy on primate cerebral activity. *Baldwin, M.; S. A. Bach, and S. A. Lewis.* p. 178.

Intermittent carotid and vertebral-basilar insufficiency associated with polycythemia. *Millikan, C. H.; R. G. Siekert, and J. P. Whisnant.* p. 188.



**JOURNAL OF PHYSIOLOGY. Vol. 149, Dec. 1959.**

◇ **A Peripheral Arterial Conducting Mechanism Underlying Dilatation of the Femoral Artery and Concerned in Functional Vasodilatation in Skeletal Muscle.** S. M. Hilton. pp. 93-111.

In cats under chloralose anesthesia volume changes of a 2 cm. length of femoral artery were continuously measured. A dilatation of the femoral artery occurred in response to a 10 sec. tetanus of the muscles of the lower legs. The dilatation appeared about 18 to 20 seconds after the onset of the tetanus and reached its maximum at 40 to 50 seconds. The dilatation also appeared after arterial injection into the muscles of acetylcholine, histamine, bradykinin and nicotine. Dilatation occurred even when all nerves to the limb were cut and also after posterior root ganglionectomy and lumbar sympathectomy. Division of the artery, and direct application of cocaine distal to the volume recording device abolished the dilatation. The dilatation therefore appeared mediated by a conducting system in the wall of the artery itself. The response traveled along the artery wall at the rate of 10 cm./sec. and since no known nerve fiber systems were responsible, it appears that the conducting elements are the smooth muscles in the media of the vessel. This peripheral conducting mechanism of functional vasodilatation may be involved in other local vasodilator reactions previously attributed to axon reflexes.

◇ **Breathing and the Thermal Environment in Young Rabbits.** K. Adamsons, Jr. pp. 144-153.

Oxygen consumption and respiratory rates were measured simultaneously in anesthetized, new born, and young rabbits in either neutral or cool environments, breathing air or 10 per cent oxygen. In the neutral environment hypoxia caused a well maintained and considerable hyperpnea but no change in oxygen consumption. Breathing air in a cool environment caused an increase in oxygen consumption and a moderate hyperpnea. Breathing 10 per cent oxygen in a cool environment caused a decrease in oxygen consumption with only a small change in the respiration. It is suggested then, that the failure of new born babies to maintain hyperpnea during hypoxia is not due to a depression of the respiratory center. The thermal environment of the newborn baby is probably cool relative to its previous existence and hence there is no hyperpnea during hypoxia because of a decrease in oxygen consumption.

**Presynaptic failure of neuromuscular propagation in rats.** Krnjevic, K., and R. Miledi. p. 1.

**Experiments on the sight of action of tubocurarine when applied via the cerebral ventricles.** Feldberg, W., and J. L. Malcolm. p. 58.

**A study of intracellular potentials and contractions in atria, including evidence for an after potential.** Vaughan-Williams, E. M. p. 78.

**The effect of lowered muscle temperature on the action of neuromuscular blocking drugs in man.** Cannard, T. H., and E. Zaimis. p. 112.

**The spindle motor nerves to the gastrocnemius muscle of the rabbit.** Diete-Spiff, K., and J. E. Pascoe. p. 120.

**The blood-brain barrier and the extracellular space of brain.** Zavaioni, H., and E. Spaziani. p. 135.

**The nature of the phasic and the tonic responses of the anterior byssal retractor muscle of mytilus.** Jewell, B. R. p. 154.

**Pressure-volume relationships in the chest before and after death.** Shephard, R. J. p. 178.

**The effect of increased filling pressure on rhythmicity and atrial ventricular conduction in isolated heart.** Keating, W. R. p. 193.

**NEUROLOGY. Vol. 10, Mar. 1960.**

◇ **Neurologic Aspects of the Möbius Syndrome.** M. W. Van Allen, and F. C. Blodi. pp. 249-259.

The Möbius syndrome is a congenital, nonprogressive disease. Facial paralysis that usually spares the lower face and platysma and an inability to abduct the eyes beyond the midpoint



are the cardinal features of the disease. Partial atrophy of the tongue and paralysis of the soft palate and the muscles of mastication may also occur. Mental retardation may also be present. The defect in ocular motility has loosely been referred to as abducens paralysis or external rectus paralysis.

A case report of the Möbius syndrome is presented which included electromyographic examination of the extraocular and facial muscles. Action potentials were obtained in the external rectus muscle bilaterally when the muscle was stimulated by needle movement. Spontaneous activity waxed and waned in intensity and was punctuated by sudden bursts of potentials from motor units firing in large numbers. Simultaneous recordings from the external and internal rectus muscles did not show the normal patterns of reciprocal excitation. Action potentials were also found in the orbicularis oculi muscle when the needle electrode was moved. No voluntary contractions of the facial muscles were present and no contraction was obtained on strong electrical stimulation of the facial nerve or facial muscles. It is concluded that the ocular paralysis is due to a supranuclear paralysis and to a lesser degree to nuclear deficiency, and that the term abducens paralysis is insufficient and misleading. The failure of the facial muscles to contract on electrical stimulation may be the consequence of the entrapment of muscle fibers in fibrous tissue.

◇ **Relation of Millipore to Healing and Regeneration in Transected Spinal Cords of Monkeys.** J. B. Campbell, and W. F. Windle. pp. 306-311.

Spinal cord transections were produced in 21 monkeys. A sheet of Millipore was passed beneath the cord in the subdural space and the ends brought together to form a sheath about the cord at the site of the transection. No effort was made to approximate the stumps of the cord. The size of the gap at the site of transection varied from 2 to 6 mm. in length. The monkeys died or were sacrificed from 4 to 118 days after surgery and the appropriate region of the spinal cord studied histologically. Although in this series of experiments no neurons bridged the gap, the Millipore unquestionably limited scar formation. When the Millipore sheath remained stable, cellular growth was more satisfactorily oriented. Intraspinal neurons exhibited regenerative potentialities. Sprouts were seen three weeks after surgery and a substantial later outgrowth was present 17 weeks postoperatively. The sprouts took on the appearance of peripheral nerve fibers on leaving the spinal parenchyma and on entering a region of connective tissue.

◇ **Effects of Thiosemicarbazide on spinal reflex activity.** Eidelberg, E., and N. A. Buchwald. p. 267.

**Determination of pathological human brain representations and modifications of signs and symptoms of some neurologic disorders by the use of high level ultrasound.** Meyers, R.; F. J. Fry; W. J. Fry; R. C. Eggleton, and D. F. Schultz. p. 271.

**Transverse myelitis with recovery: the only manifestation of systemic lupus erythematosus.** Granger, D. p. 325.



**ANNALS OF PHYSICAL MEDICINE. Vol. 5, Feb. 1960.**

◇ **Electrodiagnostic Definition of the Site and Nature of Peripheral Nerve Lesions.** P. Bauwens. pp. 149-152.

Nerve compression can produce at least four pathological states: neurapraxia, axonostenosis, axonocachexia secondary to axonostenosis, and axonotmesis. Electrodiagnostic examination may distinguish these states. In neurapraxia, which is a form of block to the impulse, stimulation of the nerve above the lesion produces no response while stimulation below reveals a normal threshold of excitability and normal conduction velocity. In axonostenosis conduction velocity is reduced over the affected stretch of nerve. As a result, stimulation above the lesion produces an action potential in the corresponding muscle which shows temporal dispersion. Stimulation below the level of the lesion results in normal responses. In axonocachexia, conduction velocity is reduced at the site of the compression and along the entire length of nerve distal to the block. Throughout this entire portion threshold is grossly increased. On stimulation at the point of compression or distally, the resultant action potential exhibits temporal dispersion. In axonotmesis there is no response in the muscle of the affected nerve regardless where the nerve is stimulated. Fibrillation potentials are found and strength duration curves are consistent with denervation.

◇ **The Electromyographic Changes in Hyperkalaemic Familial Periodic Paralysis.** J. B. Morrison. pp. 153-155.

Hyperkalaemic familial periodic paralysis is a disease manifested by spontaneous attacks of paralysis involving the limb and trunk muscles. The attacks may be precipitated by physical exertion and may last for one-half hour. Hunger, dampness and cold weather may accentuate the attacks. The disease is hereditary and is usually seen in childhood. It is thought to be due to an increase in the serum potassium as a result of an excessive ionic transfer of potassium from the cells into the intercellular spaces. An oral dose of 1 to 2.5 grams of potassium may precipitate an attack in an affected patient. Electrodiagnostic examination before an attack shows normal responses to galvanic and faradic stimulation. During an attack galvanic stimulation is normal and the response to faradic currents is reduced. Electromyographic examination is normal prior to an attack. During an attack fibrillation and myotonic runs are seen. On volition polyphasic potentials of up to 7 to 8 phases with amplitudes up to 300 microvolts occur. High frequency myopathic patterns of low amplitude and short duration are also present.

Accidents in a department of physical medicine. *Harris, R.* p. 156.

Two cases of neck pain presenting difficulty in diagnosis. *Williams, I.* p. 168.

Rehabilitation of the elderly patient. *Warren, M. W.* p. 170.



## BRAIN. Vol. 82 (Part 4), Dec. 1959.

◇ Epidemic Vertigo. Clinical Picture, Epidemiology and Relation to Encephalitis. *Einer Pedersen.* pp. 566-579.

This is a report describing a disease of sudden onset characterized by vertigo, nausea and vomiting. The symptoms during the first episode may last for many days, later being paroxysmal, precipitated by head movement or change in posture. The disease occurs in epidemiological association with encephalitis or upper respiratory disease. Various laboratory studies were done on the patients but virus studies were reported to be negative for the more common etiological agents.

◇ Clinico-Pathological Considerations of Temporal Lobe Epilepsy Due to Small Focal Lesions. A Study of Cases Submitted to Operation. *Murray A. Falconer, and John B. Cavanagh.* pp. 483-504.

The authors studied the excised temporal lobes of 70 patients undergoing surgery for temporal lobe epilepsy. In 23 instances, or approximately  $\frac{1}{3}$  of the patients, small focal lesions were discovered. There were 13 neoplasms, mostly gliomata, two vascular malformations, five cortical scars. The authors show that grand mal seizures were less frequent with laterally placed lesions. Disturbance of smell and taste were found only with medially placed lesions, particularly of the amygdaloid complex. There was excellent clinical recovery following this radical lobectomy procedure.

Upper brain-stem compression and foraminal impaction with intracranial space-occupying lesions and brain swelling. *Howell, D. A.* p. 525.

Some applications of the urinary phenolsuphophthalein excretion test in hydrocephalus and related conditions. *Laurence, K. M.* p. 551.

Cerebrospinal-fluid proteins, glycoproteins, and lipoproteins in obstructive lesions of the central nervous system. *Hill, Norman C.; Norman P. Goldstein; Bernard F. McKenzie; Warren F. McGuckin, and Hendrik J. Suen.* p. 581.

Fasciculi proprii of the spinal cord in man. Review of present knowledge. *Nathan, P. W., and Marion C. Smith.* p. 610.

Oculomotor responses on vestibular stimulation of monkeys with lesions of the brain stem. *Shanzer, Stefan, and Morris B. Bender.* p. 669.



## JOURNAL OF PEDIATRICS. Vol. 56, Jan. 1960.

◇ Drug Allergy in Pediatric Practice. *Haskell Rabinowitz, and Salmon R. Halpern.* pp. 75-87.

This is an extensive review related particularly to drugs in pediatric practice, but neither the drugs nor the reactions are limited to children. The authors have excluded idiosyncrasy, toxicity, side effects and secondary effects. There is a discussion of factors influencing sensitization as well as discussion of manifestations of allergy in common drugs and their reactions, prevention and treatment, and the mechanisms involved in drug allergic reactions. The authors point out that the reproduction of allergic manifestations by administration of the suspected offending drug is not wise. They stress that one should believe the patient who says he is allergic to a drug, recommend caution in the use of all drugs, and urge more and better reporting of allergic reactions to drugs.

**Coarctation of the aorta and associated patent ductus arteriosus.** Goldring, David; Horatio Padilla; Thomas B. Ferguson; M. Remsen Behrer; Alexis F. Hartman, Jr.; Benjamin Zwirn, and Frederick T. Kraus. *With the technical assistance of Charles Crawford.* p. 30.

**Sarcoma of the leg in a newborn infant.** Shafter, Alan D. p. 97.

**Systemic Lupus Erythematosus.** Holman, Halsted. p. 109.

**Sex-chromatin pattern in a case of hemophilia.** Blattner, Russell J. p. 128.



## JOURNAL OF PEDIATRICS. Vol. 56, Feb. 1960.

### "Festschrift for Borden S. Veeder"

◇ **Osteogenesis Imperfecta and Odontogenesis Imperfecta: Clinical and Genetic Aspects in Eighteen Families.** Florence M. Heys; Russell J. Blattner, and Hamilton B. G. Robinson. pp. 234-244.

The authors have reviewed the family histories and physical findings in 18 families showing osteogenesis imperfecta, odontogenesis imperfecta, or both conditions in association. They state that "these mesodermal disturbances are definitely familial and appear to be genetically dominant and autosomal but may be extremely variable in the degree of phenotypic expression." There were 167 members of the 18 families with one or both defects. Deafness, probably due to involvement of the stapediovestibular area, is an additional manifestation in some individuals. The report presents genealogies of four families and good illustrations of the dental manifestations.

◇ **Teratogenesis with Cancer Chemotherapeutic Agents.** Russell J. Blattner; Alice P. Williamson; Lydia Simonsen, and G. Gordon Robertson. pp. 285-292.

This is a study of the effects of cytotoxic agents and antimetabolites as well as azaserine and hydrocortisone on the development of the chick embryos. All the drugs studied produced interference with embryonic development at some concentrations, apparently related to the range of effective sublethal dose. The defects occurred in the encephalon, optic cup, lens, somites, and limb buds. A summary of malformations associated with the use of Aminopterin to produce abortions completes the paper. It appears that an effect has been obtained in human embryos similar to that which the authors have demonstrated in chick embryos.

**Studies on sodium in bone.** Forbes, Gilbert B. p. 180.

**Diabetes mellitus: observations, theoretical and practical.** Bessman, Samuel P. p. 191.

**Studies in hypoglycemia.** Hartmann, Alexis F., Sr.; Hulda J. Wohltmann; Jean Holowach, and Bettye M. Caldwell. p. 211.



## PEDIATRICS. Vol. 25, Jan. 1960.

◇ **Trimethadione (Tridione) Nephrosis in Rats.** Walter Heymann; Donald B. Hackel, and Janet L. P. Hunter. pp. 112-118.

The authors have studied the effect of Tridione on rats over a period of 4 to 18 months. Although there have been reports of the nephrotic syndrome complicating prolonged use of the drug, earlier attempts at producing the disease in experimental animals were not completely successful, probably because of the short period of observation. Proteinuria did not appear usually before the drug had been given for 5-6 months in this study. Eleven of the 22 ani-

mals studied developed proteinuria, hyperlipemia, and histologic lesions. Renal failure developed in three. All animals treated for six months or more showed histologic lesions, even though half developed no azotemia or proteinuria. The authors point out that it is imperative to check the renal status of patients receiving diuretic derivatives.

◇ **Therapy of Cystic Fibrosis of the Pancreas.** Harry Shwachman. pp. 155-163.

This disease in the past was of little significance to the internist and physiatrist because of almost certain fatal outcome. Recent application of medical advances has prolonged life by many years, and as a result, a number of patients are now in adolescence and young adulthood. Dr. Shwachman reviews the principles of diagnosis and management which have resulted not only in prolonged life but a degree of health allowing a normal life to many. The first extremely important point is to treat children with clinical pictures consistent with the disease in the face of equivocal laboratory evidence, since many will show typical findings later. He emphasizes the role of education and instruction of the parents regarding the disease and its treatment. He gives emphasis to the role of physical therapy in promoting postural drainage, pulmonary ventilation, and breathing exercises. It is an unfortunate commentary on the status of breathing exercise in American schools of physical therapy that he must give credit to English-trained therapists for demonstration of the value of these procedures in the clinic, accompanied by the statement: "It should be pointed out that the methods employed are in constant use in chest clinics in England." In view of the continuously improving medical status of these children, it is extremely important that they have the advantage of physical therapy. To ensure this, we must train students in all the American schools in these techniques.

**Failure to induce dietary deficiency of copper in premature infants.** Wilson, John F., and M. Eugene Lahey. p. 40.

**Leukocytosis as a complication of prednisone therapy in rheumatic fever.** Harris, T. N., and Harvey N. Vandergrift. p. 80.

**Viruses of the acute communicable disease.** Robbins, Frederic C. p. 119.

**Proceedings — abdominal epilepsy in childhood.** Schade, George H., and Helen Gofman. p. 151.



**PEDIATRICS. Vol. 25, Feb. 1960.**

◇ **A Controlled Trial of Edathamil Calcium Disodium in Acrodynia.** James E. McCoy; Ivo J. Carre, and Mavis Freeman. pp. 304-308.

Ten children satisfying all the criteria of acrodynia were selected for study. Five received the chelating agent and five were studied as controls. Others with complicated acrodynia or exposure to mercury were observed. The opportunity to study this comparatively large group of infants who had ingested mercury is due to the prevalence of "teething powders" dispensed in Australia and which contain calomel. It is of importance to note that although the presence of mercury was demonstrated in the urine of all 31 patients having acrodynia, the urinary concentration did not correlate with the severity of the disease. The chelating agent did not alter mercury excretion or the clinical course of the children.

◇ **Chronic Lead Encephalopathy.** Harry H. White, and Fred D. Fowler. pp. 309-315.

The authors report a case of chronic lead poisoning in a child whose presenting symptoms were behavior disorder and progressive deterioration. The onset of symptoms was fairly rapid, occurring shortly after a fall in which she struck her head. Language regressed, behavior became difficult, and she became enuretic and encopretic. Laboratory studies showed a diffusely abnormal EEG and positive urinary coproporphyrins. There were lead lines in the long bones. There was a blood level of 0.18 mg./100 ml. of lead. There was no basophilic stippling of the red blood cells. The child was treated with edathamil calcium-disodium for several days. Shortly the child's behavior and level of activity improved. The EEG reverted to normal rapidly. This case report emphasizes the importance of suspecting heavy metal poisoning in central nervous system diseases, early recognition, and adequate treatment to reverse the process as early and completely as possible.

**Commentary — use of amino acids as dietary supplements.** May, C. D. p. 189.

**Influence of diet on body composition.** Filer, L. J., Jr.; L. S. Baur, and Helen Rezabek. p. 242.

**Frequency of positive sex-chromatin pattern in mental deficiency.** Mosier, H. David; Lawrence W. Scott, and Lloyd H. Cotter. p. 291.

**Early medical care of delinquent children.** Deisher, Robert W., and Jay F. O'Leary. p. 329.

**Public health — research in childhood accidents.** Wheatley, George M., and Stephen A. Richardson. p. 343.



## JOURNAL OF CLINICAL INVESTIGATION. Vol. 39, Jan. 1960.

◇ **Studies on the Collagen and Elastin Content of the Human Lung.** John A. Pierce, and Joe B. Hocott. pp. 8-14.

The demonstration that the physical properties of the lungs are markedly different in old and young men, has stimulated the interest of the authors in the collagen and elastin content of human lungs. The findings have been correlated with variations in the age and sex of the subjects. Collagen and elastin content of the right middle lobes of 48 people was measured. The group included 29 males and 19 females, ranging from 2 to 80 years of age. The right middle lobe was studied because it is an easily identified and complete unit of the lung. The specimens were obtained at autopsy from subjects who did not die of disease primarily involving the lungs.

Although a wide range of values was encountered, the results have failed to reveal any significant change in lung collagen with advancing age. Elastin, however, showed a highly significant and striking increase with age whether expressed as percentage of initial dry weight or as total amount of the right middle lobe. A correspondent and consistent decrease of the lung collagen to elastin ratio with advancing age was evident. No explanation is available regarding the increase of elastin with age. One hypothesis is that the development of elastin fibers might be stimulated by rhythmic stress of tissue.

The lungs of women were found to have a higher content of collagen and elastin when expressed as a per cent of initial dry weight of the sample. There was, however, no significant difference between sex in the total quantities of collagen and elastin in the right middle lobe. Thus it appears that women have more lung scleroprotein per unit of lung volume. Whether this observation bears any relation to the known preponderance of pulmonary emphysema in men is uncertain.

◇ **The Effect of Exercise on the Concentration and Turnover of Plasma Non-esterified Fatty Acids.** S. J. Friedberg; W. R. Harlan, Jr.; D. L. Trout, and E. H. Estes, Jr. pp. 215-220.

This work reports on the effect of exercise on the fatty acids (FFA) content of the plasma. A previous study had suggested that the albumin-bound fatty acids of blood might be oxidized directly by muscle. If this is so, acute changes would be expected to take place in the blood during increased physical activity.

On seven young, healthy male volunteers between the ages of 20 and 25, the arterial plasma FFA level was determined before, during and after vigorous exercise. The subjects exercised vigorously for 15 minutes by pedaling a stationary bicycle. The results reveal consistent, fairly large and rapid falls in the level of arterial FFA during exercises. The average control level of 0.87 m Mole per L. fell to 0.64 m Mole per L. during exercise, a drop of 26.4 per cent. After a 15 minute rest period, the average level rose to 1.02 m Moles per L., a level significantly greater than the control values. In two subjects the blood lactic acid level was also measured and found considerably elevated during exercises, rising from 10.9 to 68.9 mg. per 100 ml. in one subject and from 7.2 to 67 mg. in the other. A possible effect of this elevated lactic acid production on the level of plasma FFA seems improbable. The increase in blood concentration of lactic acid persists much longer than the decrease in plasma fatty acids, and the authors have shown in a single experiment, that the infusion of sodium lactate has no effect on plasma FFA.

In order to prove that the lowering of FFA during exercise is due to an accelerated removal from and not to a decreased entry into the vascular compartment, the effect of exercise on the disappearance of injected, prepared albumin-bound radiopalmitate was studied. Eight healthy volunteers were given 0.002 mc. of albumin-bound acid —  $1\text{-C}^{14}$  intravenously. The rate of disappearance of labeled palmitic acid was found to be more rapid during exercise than at rest. The fate of the removed FFA is not known, and this problem is at present under study in the authors' laboratory.

**Synthesis of cholesterol and fatty acids in fractions of peripheral nerve.** Hughes, Ann H., and Sven G. Eliasson. p. 111.

**Effect of deep and quiet breathing on pulmonary compliance in man.** Ferris, Benjamin G. Jr., and David S. Pollard. p. 143.



### **JOURNAL OF CLINICAL INVESTIGATION. Vol. 39, Feb. 1960.**

◇ **Cardiopulmonary Physiological Responses to Heavy Exercise in Patients with Anemia.** Brian J. Sproule; Jere H. Mitchell, and William F. Miller. pp. 378-388.

The cardiopulmonary compensatory response of nine patients with anemia of various types were investigated at rest and during severe exertion. The internal and external respiration of anemic individuals at rest is adequately maintained by expansion of the available hemodynamic and pulmonary compensatory mechanisms. These are mainly represented by an increased cardiac output and stroke volume, an increased ventilatory volume and a faster respiratory rate, a shift to the right of the oxygen dissociation curve, and an increased desaturation of venous blood which augmented carbon dioxide transport.

Equivalent grades of exercise resulted in similar levels of minute ventilation in normal and anemic subjects. However, the anemic individuals moved a smaller tidal volume at a faster respiratory rate and the physiological dead space increased relative to tidal volume much more in violently exercising anemic patients than in normal subjects. Alveolar ventilation was therefore less in the exercising anemic subjects than in the exercising normal subjects.

It is noteworthy that both normal and anemic subjects demonstrated a marked increase in stroke volume from rest to strenuous exercise. The anemic individuals had a larger stroke volume than normal at rest and while a further increase was obtained during exercise, it was only such as to make the normal and the anemic stroke volume comparable. Cardiac output, pulse rate, central blood volume and mean circulation time during exercise were also approximately the same in anemic patients as in normal subjects. Differences between normal and anemic subjects were evident in blood gas exchange. A markedly decreased oxygen carrying capacity limited the possibility of expanding the arteriovenous  $O_2$  difference. The oxygen removal rates per liter of ventilation, as well as the total oxygen intake per minute were found to be significantly less in anemic than in normal subjects. The  $CO_2$  production of the anemic individuals was similarly depressed relative to normal. The  $CO_2$  content and  $CO_2$  tension of both arterial and venous blood were less than normal in subjects with anemia. The arteriovenous  $CO_2$  content and tension differences were less in exercising anemic subjects than in exercising normal subjects.

In conclusion this study suggests that although the anemic state itself may, to a slight extent, alter the ability of the cardiopulmonary apparatus to respond to stress, the predominant limitation upon the exercising anemic individual is imposed by an abnormally decreased quantity of available hemoglobin.

◇ **The Effects of Exercise on Central Blood Volume in Man.** Eugene Braunwald, and Eugene R. Kelly. pp. 413-419.

Changes in blood volume distribution is a well-known occurrence in a wide variety of conditions and following the administration of a number of pharmacologic agents. A redistribution of circulating blood volume occurs during muscular exercise. Difference of opinion exists, however, regarding the influence of muscular exercise on the "central blood volume." This study is a contribution to the problem.

The effect on central blood volume of ten minutes of moderately heavy leg exercises in the supine position was studied in ten normal subjects. Central blood volume was calculated by the Stewart-Hamilton formula from arterial dye-dilution curves following superior vena-caval or right arterial injection. The central blood volume determined in this study is considered to represent the volume within the vascular bed between the site of injection in the right atrium or superior vena cava and the site of sampling in the brachial artery. It therefore comprises not only the blood in both sides of the heart and lungs, but also includes a significant fraction of the blood in the large arteries.

During exercise the cardiac index rose from an average of 3.42 to 7.99 L. per minute per  $m_2$ . The central blood volume increased by 141 to 745 ml. in eight subjects; it remained essentially unchanged in one subject and declined 397 ml. in the tenth. For the group as a whole the increase in central blood volume averaged 285 ml. During 20 minutes of recovery the central blood volume declined in all ten subjects by an average of 375 ml., with a fall ranging from 127 to 782 ml.

It appears that the optimal cardiovascular response to exercise is characterized by an augmentation of central blood volume accompanying an elevation of cardiac output commensurate with the increased peripheral oxygen requirements.

**Effect of leukocyte and synovial membrane extracts on cartilage mucoprotein.** Ziff, Morris; H. Joel Gribetz, and Joseph Lospalluto. p. 405.





## ★ book reviews ★

**PRECIS D'ELECTROMYOGRAPHIE.** By *J. Dumoulin* and *Ch. Aucremanne*. Cloth. Price, not given. Pp. 173, with illustrations. Librairie Maioine, 27 Rue de L'Ecole de Medicine, Paris, 1959.

This book written in French is in the form of an atlas. The foreword by Fritz Buchtal states "The authors have tried to present an elementary guide to electromyography without tears." All in all I found this book to be an extremely disappointing work. One gains the impression that electromyography can be carried out in the same manner as electroencephalography, that is, by the reading of tracings. The authors begin by describing in an extremely superficial manner the type of apparatus which can be used, but neglect the type of apparatus usually used in the United States—oscilloscope and audible observation. As part of this technical description, a circuit diagram of an electromyograph is included. This circuit diagram is extremely complicated and would require complete redrawing in order to understand it. It really is a wiring diagram and presents no interest to the reader. A simplified circuit diagram of a differential amplifier would have been more appropriate.

The tracings presented are taken at extremely slow speeds, not really permitting the observation of wave forms or durations. The parameters of the tracings are not described in any of the examples given, and it is necessary to infer that the sinusoidal wave form seen at the bottom of most of the tracings is a 50 cycle wave form. The voltage of this wave form is never mentioned, although the average voltage of the potentials demonstrated is noted. The printed graph illustrates speeds usually of either 30 or 7 cm./second. The "fast" speed of 30 cm./second thus represents a speed of about 85 milliseconds/inch, while the slower speed corresponds to 350 milliseconds/inch. Few electromyographers in this country would use the rapid speed as their slowest speed, and I know of none who would use the extremely slow speed except for kinesiological studies.

In spite of these faults, very complicated descriptions are given of the wave forms, many of which are not apparent on the tracings. Certain gross errors also enter into the descriptions. For example, the statement is made that the "dive bomber potentials" of myotonia never exceed a frequency of 50 per second. At another point the 50 cycle rhythm stated by Piper 50 years ago as characteristic

of maximal voluntary contraction is illustrated by a very unconvincing graph of this rhythm. A bibliography of 800 references, including a few which are only vaguely related to electromyography, is appended. (*J. B. R., M.D.*)

**SURGERY OF THE FOOT.** By *Henri L. DuVries*, M.D. Cloth. Price, \$12.50. Pp. 494, with 403 figures. The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1959.

Those physicians concerned with the diagnosis and management of common disorders of the human foot will appreciate and profit from the author's experience, observation, and results in his treatment of this disorder. He early recognized that simplicity does not diminish distress and so he has filled a void in medical and surgical curricula and writing in this neglected area. This book should prove an invaluable reference book to general practitioners, pediatricians, physiatrists and those surgical specialists, including the orthopedic surgeon confronted with the problem. It will also be of special interest to anatomists, physiologists and the several therapist groups concerned with human locomotion and its restoration.

The book is well organized and a review of the table of contents quickly demonstrates the scope of the work. It begins, properly, with a review of the anatomy, function and structure of the foot, passing quickly to principles of examination, diagnosis and treatment, including operative considerations and requirements. Deformities, diseases and injuries of the foot are then taken in turn and cover disorders of skin and appendages, fascia and synovia, and the nerves. The tendons and the bones, including the sesamoids, anomalies and congenital defects as well as static deformities are covered in detail; the chapter on amputations concerns itself with the lesser procedures for the phalanges and forefoot, to include transmetatarsal amputations and is especially valuable to those physicians caring for industrial and agricultural accidents.

The figures, line drawings and photographs are an outstanding feature both for their clarity and instructional value. The text itself is extremely well written and the workmanship deployed in the volume is of such quality as to make for pleasant and profitable reading. (*John H. Kuitert, M.D.*)

**RECENT PROGRESS IN HORMONE RESEARCH:** The Proceedings of the Laurentian Hormone Conference. Vol. 15. Cloth. Price, \$12.50. Pp. 504, with illustrations. Academic Press, Inc., Publishers, 111 Fifth Ave., New York 3, 1959.

This volume presents the proceedings of the 1958 Laurentian Hormone Conference, which, as stated by the editor, was planned to "highlight substantial modern developments in hormone research rather than illuminate a single theme." Although there could be disagreement on which modern developments require attention, this work has been well conceived and presented to yield a volume of interest to a wide variety of workers. To illustrate its varied scope of interests, the physician will find papers on human growth hormone and parathyroid hormone stimulating and useful while the chemist or biochemist will be attracted by papers such as the two on steroid protein conjugates.

Work in four areas is presented in this volume. The first section on "The Pituitary Hormones" includes papers on the physiology of human and animal growth hormone, purification of the pituitary gonadotropins and a study of human gonadotropins. The second section, "Aspects of Steroid Chemistry and Metabolism," includes two papers on the chemistry and biological activity of steroid-protein conjugates and a paper on turnover of adrenocortical steroids in man. The important steroid, aldosterone, is discussed in two papers of the third section entitled "Aldosterone Chemistry and Physiology." The fourth section, "Hormones and Metabolism" contains four papers covering the pituitary-adrenal-cortical system, steroids and lymphocyte metabolism, parathyroid hormone, and calcium deprivation.

This volume is believed to be a very useful and interesting collection of work in hormone research. The mechanics of the book, indexing, etc., are well done. (*Robert R. Smeby, Ph.D.*)

**PSYCHOTHERAPY AND SOCIETY.** Psychotherapy for the Many and the Few. By *W. G. Eliasberg, M.D., Ph.D.* Cloth. Price, \$6.00. Pp. 223. Philosophical Library, Inc., 15 E. 40th St., New York 16, 1959.

It has been said that we live in an age of anxiety. The extensive use of sedatives, tranquilizers and "social tranquilizers" by so many certainly supports this statement.

Doctor Eliasberg, in this book, analyzes the anxieties of the many and the few and describes how psychotherapy may help people live more effective lives and be more complete beings. But there is much more in the 200 pages of this book than merely a recipe for better living. The author is a psychiatrist, a psychologist, a philosopher, a sociologist, and an historian. He is also an author who is well

recognized for his books on propaganda, forensic psychiatry, and labor and industry, to mention but a few.

The author brings new light upon the development of psychotherapy through the ages according to the prevalent needs of the people, and of the distortions of behavior which result from cultural and social stresses such as malpractice, iatrogenics, advertising, and quackery. New insights are unveiled with reference to the personalities of the many and the few, the employer and the employee, the wealthy, the politicians, the artists, the celebrities, the elite, and the would-be elite. There are over 30 case illustrations, five brief appendices and there is an extensive and useful bibliography.

This thought-provoking and informative book has much to commend it. It will be of prime interest to students of psychiatry, sociology, and psychology, but will be enjoyed by all those who are interested in people and who are concerned about alleviating society's anxieties and promoting better mental health. (*Richard Weatherhead, M.D.*)

**TRAUMA.** By *Harrison L. McLaughlin, M.D.* Cloth. Price, \$18.00. Pp. 784, with illustrations. W. B. Saunders Co., W. Washington Sq. Philadelphia 5, 1959.

The author is certainly well qualified to produce a monograph of this quality and magnitude, which he states is intended for medical students, residents and practitioners who may not receive complete surgical training, yet will be called upon to care for the great majority of civilian trauma. He has, as contributors, a worthy group of specialists who, with one exception, are or have been members of the attending staff of the Columbia-Presbyterian Medical Center and of the faculty of the College of Physicians and Surgeons of Columbia University.

The volume is divided into five parts, with a total of twenty-five chapters. The first part is devoted to general considerations of trauma, including the response to injury, general principles in the treatment of trauma, infection and antibacterial agents in trauma, and thermal and vascular trauma. Part two is concerned with the upper extremity, part three the lower extremity, part four the trunk and concluding with part five, considerations of trauma to the head and special senses. As might be expected, those sections dealing with the extremities are concerned primarily with orthopedic trauma. Here we note not only the management of common fractures of the long bones but outlines of the methods of handling those more severe and complicating injuries to the joints and the profound damage resulting from compound injuries. The section dealing with the trunk is, in the opinion of this reviewer, the most outstanding, for here, in a relatively short space, are presented the tenets of management of open and closed in-

juries of the thorax and abdomen in a most concise and clear fashion. Few questions are left unanswered in the discussion of these complex areas. The general considerations of trauma are also enlightening, since newer technics in the care of vascular injuries which have developed from the handling of these casualties in the Korean conflict are presented. A summary of current burn therapy is well presented which includes electrolyte balance and fluid therapy.

The book is profusely illustrated with excellent line drawings and radiological reproductions which supplement the text well. The type is large and the chapters sub-divided and outlined simply, which permits very easy and comfortable reading. The index allows ready reference to individual sections when desired.

This reviewer feels that the author and his contributors have succeeded well in their mission stated in the preface—that of producing a source of information for the student, resident and practitioner who is called upon to treat trauma.

This volume should certainly be read and digested by all physicians, regardless of the nature of their specialty, for we know not what problem any physician may be called upon to treat should a large scale disaster befall community or large area. Familiarity with the concepts set forth here will do much to provide the physician with the background required to act competently and securely in such a situation. We must realize that in disaster planning all physicians must become specialists in trauma, to a greater or lesser degree—the opportunity for referral and consultation does not exist in caring for the numbers of injured which may result from acts of war or other means of producing mass casualties. This book is a realistic and most valuable contribution to our knowledge of the treatment of trauma, and is recommended without reservation.

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**OFFICE ORTHOPEDICS.** Third edition. By *Lewis Cozen*, M.D. Cloth. Price, \$9.50. Pp. 430, with 321 illustrations. Lea & Febiger, Washington Sq., Philadelphia 6, 1959.

With this book, Doctor Cozen has done an admirable job of filling a void which has long existed on the bookshelves of orthopedic textbooks. However, as he states in the preface, "At least one complete standard work on Orthopedic Surgery should be available to the physician who uses this volume." This book is restricted to the diagnostic and therapeutic procedures used in office practice.

One is first impressed by the number of photographs and line drawings, which are so informative that, by reading the captions, a reasonable summary of the subjects discussed in each chapter is possible.

Some of the therapeutic sections are in considerable detail, describing the many useful

treatments for a specific disease. However, a disturbing factor is the extent of repetition encountered. There are sentences, and even whole paragraphs, of information repeated so many times that one becomes weary of reading them. It would seem reasonable to confine these oft-repeated descriptions of technics of injection, aspiration, physical therapy, and the administration and dosage of various drugs to a special chapter. Then, when necessary, this chapter and specific page number could be referred to. Space thus saved would allow more adequate coverage of significant subjects which were lightly touched upon. For example: the disease *osteogenesis imperfecta* is simply defined, and then followed by the blunt statement, "No treatment is satisfactory." This does not seem to be sufficient coverage of a subject that requires a certain amount of office consideration.

The chapter on diseases of the back supplied thorough coverage of an important subject. Included is a valuable discussion of exercises and postural training. In view of the fact that lumbar puncture is done in many offices, I felt that this technic and the value of doing the test should be discussed in this section also.

The chapter on treatment of clubbed feet and other deformities of the lower extremities was excellent. They reflected thorough knowledge and considerable experience with these problems.

One can say that Doctor Cozen has made an excellent effort to supply the reader and user of this book with a considerable amount of knowledge resulting from personal experience in the practice of office orthopedics. (*R. G. Spears, M.D.*)

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**CLINICAL ORTHOPAEDICS.** No. 14: *Recent Advances in Orthopedic Surgery of Infancy and Childhood.* Edited by *Anthony F. De Palma*, M.D. Cloth. Price, \$7.50. Pp. 193, with illustrations. J. B. Lippincott Company, E. Washington Sq., Philadelphia 5, 1959.

The 14th number of this series is concerned primarily with recent advances in orthopedic surgery in infancy and childhood. There are the usual two additional sections, the second dealing with general orthopedics, and the third with miscellaneous items.

Section One, dealing with *Recent Advances in Orthopedic Surgery in Infancy and Childhood*, contains much information of interest to the physiatrist. Especially to be noted, are those articles concerned with the significance of growth in orthopedic surgery, the management of the juvenile amputee, and cerebral palsy involving the upper extremity. Other items are more directly concerned with surgical considerations, but, nevertheless, are most informative.

Section Two, concerned with general orthopedics, contains three excellent articles of

general interest. The first is concerned with surgical endeavors in arthritis, the second with the pathogenesis of lumbar disc lesions, and the third with the painful coccyx.

Section Three is devoted to items of quite limited application and interest from the non-surgical point.

This edition, in general, is in keeping with the excellent standards set by previous volumes, both as to subject matter and method of presentation. The articles are quite well illustrated, both with photographs and line drawings, and where appropriate, supplemented with radiographic reproductions. The accompanying references are extensive and well selected.

The number of interesting and informative articles in this volume are sufficient, in the opinion of this reviewer, to place it on the recommended list for the physiatrist, as a source of broadening a background in the

management of the infant and child with diseases of the musculoskeletal system. (*Frederick E. Vultee, M.D.*)

*Of the many things man can do  
or make here below, by far the  
most momentous, wonderful  
and worthy are the things  
called Books.*

—THOMAS CARLYLE

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Academy of Physical Medicine and Rehabilitation.



There are only two kinds of people who are  
really fascinating; people who know everything,  
and people who know nothing.

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